

Storied Numbers: Supporting Media-Rich Data Storytelling for Television

Susan J. Robinson¹, Graceline Williams¹, Aman Parnami¹, Jinhyun Kim¹, Emmett McGregor³,
Dana Chandler², Ali Mazalek¹

Synaesthetic Media Lab¹
Georgia Institute of Technology,
Atlanta, GA

{srobinson, racel.williams, aparnami,
jinkim, mazalek}@gatech.edu

School of Social Work²
Georgia State University
Atlanta, GA

dchandler3@student.gsu.edu

School of Communication³
American University
Washington, DC

blind9productions@gmail.com

ABSTRACT

The digital convergence of broadcast television, user-generated content from online and mobile sources, and interactive surfaces brings an opportunity for the development of platforms to support media-rich data storytelling for television audiences. In this paper, we report on a production model and system featuring a multi-touch interactive table with tangibles in the broadcast studio, on which performers use information visualizations to access and present media-rich content from viewers. The system uses content generated from a mobile application that couples close-ended survey items with rich media, such as video. The app is designed to increase opportunities for public debate on civic issues, but is also suitable for pure entertainment topics, such as sports and lifestyle. We present the results of an evaluation of our production model and the studio prototype in a lab setting with television production experts and on-air talent. Our results indicate that such systems must be designed with a flexible user profile in mind to accommodate performer capabilities and preferences, operational variations, program formats, and changing conventions in touch interaction.

Author Keywords

Data Storytelling; Information Visualization; Mobile Surveys; Interactive Surfaces; Interactive Television

ACM Classification Keywords

H.5.m. Information interfaces and presentation: Miscellaneous

INTRODUCTION

Today we are surrounded by more and more data, from environmental statistics to health trends, and presenting big data on television is a major challenge. How can quantitative data sets be presented to television audiences in an engaging and informative way? Successful television programs are visually engrossing, evoke human emotion,

offer suspense and surprise, and are salient to audiences. Numerical data should be enlivened and made “live” to meet these expectations from viewers. In investigating how this could be done, we found in our research that we had to create novel technologies on both the data *gathering* and *presentation* sides and combine these in a new way to adequately address this problem space. The primary goal of the research reported here was to assess the acceptability, feasibility, and usability of our overall production model and proposed technologies for broadcast studios to support media-rich data storytelling on television. For data gathering, we used the affordances of mobile media to combine two time-honored traditions in the media: the man-on-the-street interview and the public opinion survey. To do this, we used mobile phones to create a novel survey format that *tightly couples* closed-ended questions with the ability to record video explanations of choices made. The result is a new type of content that we call “storied numbers,” which become “storied data” when aggregated, lending itself to presentation using information visualization techniques.

On the presentation side, our studio system features an interactive anchor desk with multi-touch and tangible controls to support the exploration of data and stories. The set-up includes a screen display system around the table optimized for viewers to see the action, and from which program feed can be taken. This configuration supports roundtable discussion and debate programs by creating a shared information space on which experts can explore trends in the data and play out media-rich content, such as viewer video viewpoints, to spark debate. This enables audiences to see the developing analysis and to form their own insights as the narrative unfolds.

RELATED WORK

Cross-Platform Media and Television

Our system combines the strengths of mobile, networked and broadcast media with interactive surface technologies in a novel way to create an ecosystem capable of engaging audiences in the processes of generating media-rich data and its presentation in television programming. A 2013 study that collected over 600 responses on television viewer habits, dynamics, and behaviors, confirms that television is still a major platform despite other web offerings [1].

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Television broadcasts provide a unique opportunity to use cross-platform/cross-client approaches to engage technologically-connected and -adept audiences, such as use of mobile video captured by citizen journalists [10], to live Twitter feeds during political events [13], the use of mobile devices for social interaction during TV shows [3], and support of social interaction during and after television programming [2].

Interactive Surfaces and Data Storytelling

The use of interactive surfaces and data visualizations are becoming more integral to and prevalent in television broadcasting, from John King's "Magic Wall" on CNN to SportsNation on ESPN. Our system is the first to move the data visualizations on interactive displays from the wall to a tangible/multitouch studio desk, partially in response to the performance challenges introduced by vertical displays. These include the performer occluding viewers' view of the visualization and having to turn a back to the audience [12]. Interactive tables have been used for storytelling and performance for over a decade. Tangible Viewpoints coupled tabletop tangibles with multiple character viewpoints to engage users in an interactive narrative [9]. reacTable [6] and mixiTUI [11] allow users to deliver live musical performances on tabletops that utilize both touch and tangible controls. An evaluation with 117 viewers of a live performance of mixiTUI found that TUIs enriched their musical viewing experience and that they wanted to understand how digital output was being manipulated [11]. These previous works indicated that there are several design decisions that need to be considered when developing a cross-platform interactive table application for television.

To guide our design decisions on the information visualization side, we consulted works like [4]. In particular, [5] examined data visualization on interactive surfaces, identifying some of the key research questions and design considerations with regard to collaboration.

Tangible and Touch Interaction

One of the main challenges of our project was deciding when to utilize touch versus tangible controls. Our work is informed by prior research on touch vs. tangibles in this respect, e.g., [7, 8, 14]. Hybrid surface systems, those with touch and tangible controls, are discussed in [7]. In [8],

touch and tangible interfaces are compared through a timed study asking participants to perform translation and rotation functions to create a space layout through either a touch or a tangible interface. Results showed that all participants completed the tasks faster with the tangibles and thought they were easier to use. This research found that leveraging real world metaphors could contribute to making the work easier with tangibles. The downside of tangibles was their lack of reusability. Another study [14] compared touch and tangibles in manipulation and acquisition tasks. Similar to [8], users found it easiest to manipulate tangibles. In our system, we used a combination of touch and tangibles, with an emphasis on using tangibles to add visual interest and make actions visible to studio cameras and thus audiences.

SYSTEM DESIGN

The Production Model

Our model identifies three stages in the television production process during which digital media affordances can bring about change (Figure 1): content generation (production), content presentation (editorial), and performance (program). At each stage, we designed and deployed specific technologies and techniques to support viewer-participants, producers, and on-air talent in generating and working with content that contains both multivariate data and rich media. The telling of stories is not just reserved for the performance stage; it is encapsulated at each turn.

For content generation, we created a mobile application, *SayWhyPoll*, which allows users to provide video responses in addition to closed-ended survey questions. The addition of video responses provides users with the opportunity to explain their choices, tell personal anecdotes, and even dispute the framing of the question. A database back-end enables producers to create surveys in minutes and to choose between two modes of releasing the survey: "man-on-the-street" or "remote" mode. "Man-on-the-street" mode allows a journalist to administer the survey multiple times in-person. "Remote" mode allows viewers to take the survey once on their own mobile device. Quantitative survey data and geographic coordinates can be sent immediately to the server, with video sent similarly or uploaded later when a high-speed connection is available.

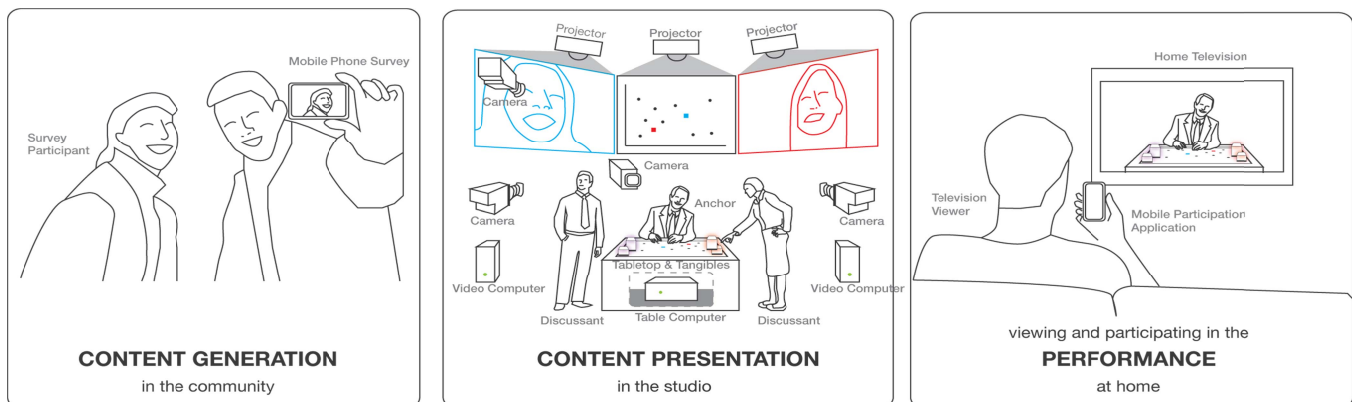


Figure 1: Cross-platform ecosystem.

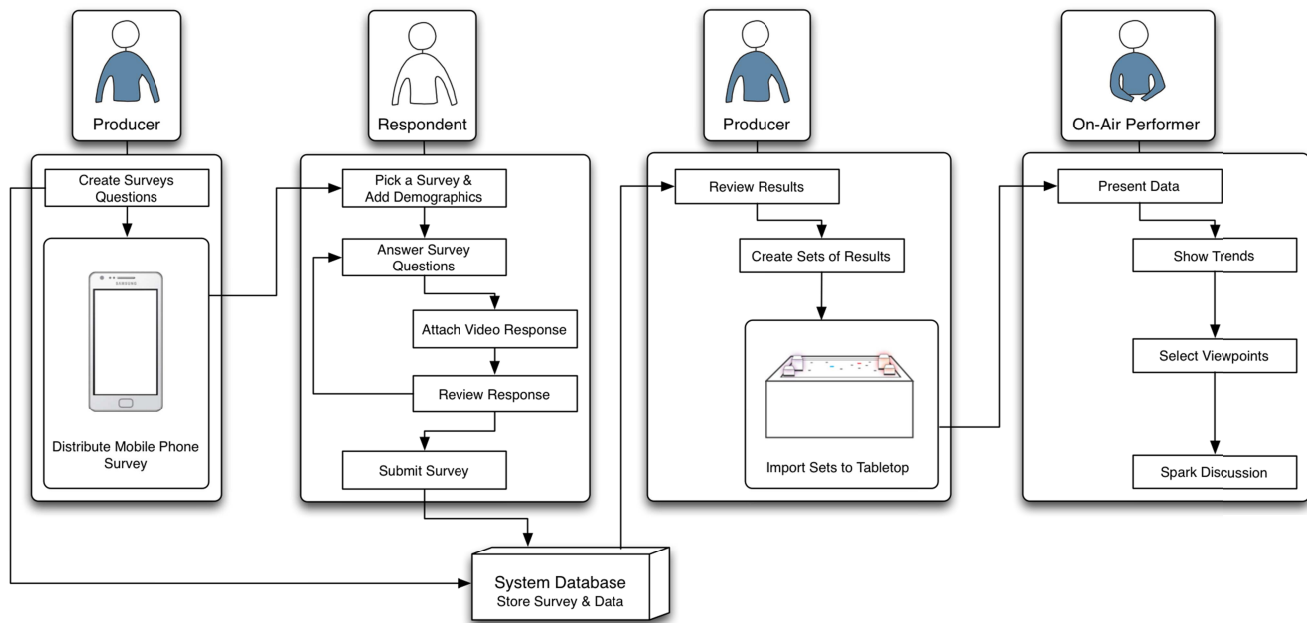


Figure 2: Cross-platform system to support data storytelling for television audiences.

For the content presentation stage, our production model inserts the human storyteller, in the form of an associate or producer who curates the content from the *SayWhyPoll* submissions to create a compelling story. While some parts of the editorial process can be automated using meta-data from the submission, such as answer values, the producer has the ultimate control. In our use case, the producer uses the same information visualization application utilized on the interactive table for on-air presentation to discover interesting content. If there are many responses, our model calls for this application to randomize the responses, so that contributors matching an item of interest have equal chances to be featured. The final step is for the producer to flag the best video viewpoints for on-air presentation indicated by visual markers, and, if desired, to note the top points to be presented in the rundown, cues, and scripts.

Deciding what type of information visualization to use is also part of the editorial processes in our model, as it shapes the story that can be told. We have previously experimented with maps and novel representations [12], as well as the scatterplots described here, and visual metaphors such as a game or race on which to plot responses. The visualization one might choose depends in part of the characteristics of the data. For example, one might visualize geographically-relevant data, like national election results, on a map, while health trends might be visualized using a scatterplot.

In the performance stage of our model, on-air talent is briefed by producers on the content highlights and the overall resulting narrative, with the level of improvisation to be determined by program format. A short segment in a structured news show would have the talent using the visualization primarily as a “player” device; but a hour-long

public issues program could have the talent using viewpoints from people from differing life situations to add depth to a policy debate.

Prototype System

Our prototype system is composed of the following components (Figure 2): 1) the *SayWhyPoll* mobile application as the content gathering method, and 2), a data visualization system dubbed *Tangible Anchoring*, currently running on a Microsoft PixelSense interactive table that is networked with machines controlling display screen output.

The *SayWhyPoll* application for smartphones is used to create customized polling surveys for use in remote or face-to-face mode. Each time a survey is delivered, the application receives a unique random-generated ID number from an online server that is attached to the poll data for indexing purposes. In addition to answering the survey questions, a respondent also has an option to attach a video, recorded through the smartphone camera, justifying their position on a particular question. On completion, the survey data—responses and videos—is uploaded to the server. Our systems’ main presentation and storytelling platform is Microsoft’s PixelSense, a commercially available interactive table that is rectangular and spans 40 inches diagonally. We set up the table to be high enough to be operated while standing or sitting on stools. In our scenario, the anchor and discussants sit around three sides of the table with the open side facing studio cameras. The PixelSense runs Windows 7 and is capable of multi-touch input, tangible object tag pattern recognition, and video output to projectors. It comes with a custom set of tag patterns for use with tangible objects on the surface, called ByteTags.

To visualize the storied data for the evaluation featured in this paper, our interactive table application, *Tangible Anchoring*, (Figure 3), implemented in the C# language with the use of the Surface SDK, was programmed to feature a scatterplot. Since our visualization aids in exploring survey data collected with *SayWhyPoll*, the data is downloaded from an online server apriori in XML format. An XML file also provides for configuration settings. The interactive table application reads the XML files and applies settings to generate a visualization.

To control the storied data on the PixelSense, several types of tangibles were developed, as shown in Figure 3. X- and Y-axis tangibles are used for sliding the visible axis window, to zoom in and out, and to rotate the categories featured along each axis. Q and A tangibles, shown in green, are used for selecting or filtering different question and answer choices. The Tagger tangible, shown in blue, enables highlighting of data points to enable persistence while changing dimensions of the visualization. Using these controls, users can explore data trends and play out videos to create a narrative about a topic of interest. For example, one can iterate through different survey questions and filter responses. Each question and filtered response presents individual survey responses with visual markers; in our prototype, these markers are either a square if a response has a video associated with it, or a circle if it does not. Using the multi-touch controls of the PixelSense, performers can drag a finger over markers to reveal meta-data about the responses such as the name and age of persons featured. Performers tap on a square video marker to play out the corresponding video on one of two overhead screens; this could signal the control room to switch what is being viewed by the audience, in a production setting.

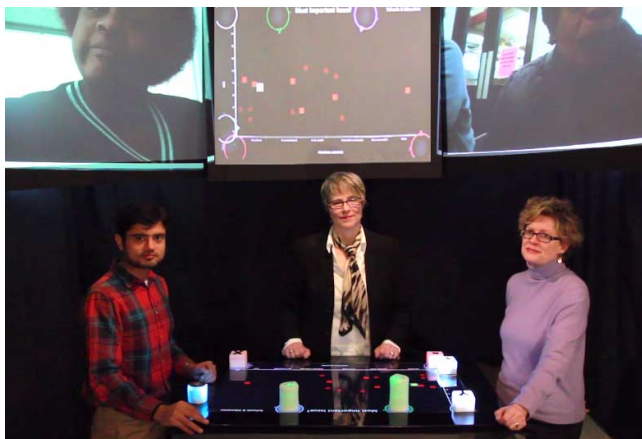


Figure 3. Interactive tabletop with scatterplot and tangible controls.

EVALUATION

The purpose of our lab study was to evaluate the feasibility and acceptability of combining data with video viewpoints for presentation to television audiences using an interactive table studio/set piece featuring information visualizations with tangible and touch controls.

Methods

Our protocol called for a cooperative think-aloud combined with an in-depth interview, followed by a user experience survey, to be administered by a researcher who was an expert in television studio production. The interview guide was structured to: 1) elicit feedback on the overall model of gathering rich-media survey content via mobile phones and presenting it using a tabletop information visualization; 2) prompt responses during and after the cooperative think-aloud on specific details of the user's experience; and 3) provide reactions to a scenario-of-use in a public opinion discussion show. Our scenario-of-use presented a talk show format with an anchor and two discussants reviewing responses from public opinion poll and debating the issues.

Due to the presence of international, regional, and local television operations in our city (Atlanta, GA, USA), we were able to successfully reach experienced television professionals using a snowball sampling technique. We had a total of 14 participants, who fell into three types of experts: 1) television professionals working or who had worked in television operations, production, or as on-air talent; 2) producers of digital media content associated with news (social and on-line media); and 3) entertainment industry experts. The study took 2 hours to complete and was recorded from three camera angles to capture user behaviors and discussion.

Following the lab study, the video record was analyzed for user interaction patterns and the sessions were transcribed and analyzed for themes by five members of the research team using a common codebook. All coded transcripts were reviewed by the lead researcher and the findings were discussed among the research team for concurrence. The findings reported here are themes found across at least three respondents and the quotes provided to illustrate these themes are from a number of participants.

RESULTS

The in-depth interviews and surveys indicated that our expert study participants, who work across a range of environments and roles, found the overall production model presented feasible. They expressed that the concept of coupling survey questions with video was worth pursuing. They most often framed the approach as a way to engage audiences, in the same vein as "man-on-the-street" interviews and user-generated content give viewers the opportunity to be seen and heard. All participants, except one, indicated that such an application could be used on-air in today's environment and would be helpful when working with user-generated survey content. The interviews also yielded specific insights into how the production model and system features could be refined during the content gathering, content presentation (editorial), and performance stages to support data storytelling in the context of studio broadcast production. In the next sections, we present our results according to the production model and the technologies and techniques evaluated.

If It's Good Tape, It's Good Tape

In general, reactions to the mobile application itself were positive, with respondents seeing it as a way to reach people in their viewing area when the cost of keeping reporters in the field across distances is prohibitive. While interacting with the tabletop, participants played video clips from a pilot *SayWhyPoll* survey, some of which had poor audio. This prompted them to comment that the most important factor in content for television is the quality of the clips, which they defined as going beyond just a good recording. As one expert put it, *"if it's good tape it's good tape."* The consensus was that for interviews, "good tape" shows an energetic person making concise points that are entertaining or incisive. One news expert stated that in the U.S., the average sound bite for news programs is 9 seconds, another remarked that for discussion shows, up to 20 seconds, and these estimates were repeated by others.

Respondents could see content gathering on a topic coming from multiple sources, rather than solely gathered remotely or through man-on-the-street intercept. One felt that additional content, including packages from professionals, and paid respondents, might be in a content set. For man-on-the-street interviews to be useful, participants representing news operations felt that some level of training is essential, e.g., *"there is a format ... you want the person to repeat the question and the answer ... whereas other people ... it's not a succinct answer."* For people who might receive surveys remotely, ease-of-use is critical, and limiting the recording to short bites. One participant noted that for the content gathering to be successful overall, the questions presented must be of interest to viewers, *"I think the question is going to have to be really compelling ... if it is a question I really don't care about ... no amount of technology can get me to watch this."*

Finding the Gems

"... that sifter, that curator, seems to me as just as important as the person who is doing this, who is performing the data."

If good answers start with good questions, identifying the best viewpoints and representing them in exciting ways is dependent on the human operator in our production model. Our participants confirmed the importance of this stage and role and said that the person overseeing this stage makes or breaks the show. They identified two main functions for this stage, for program producers: 1) to select the best visualization for the content under discussion, and 2) to screen, identify, and select the top sound bites and media to be featured during the program.

While current on-air programs often feature maps on large displays, our visualization for this study, a scatterplot, controlled by touch and tangibles, was completely novel to all our participants. This new interaction and visualization provoked lively discussion about what types of visualizations would work on television, and how complex or simple these should be in terms of the number of data

points, graphics, and text, and potential viewer reactions. Most of the professionals emphasized that any visualization should be comprehensible at a glance and not overwhelm the viewer. They liked the idea of using a scatterplot, but often the conversation turned to more traditional images. One participant said, *"maybe you have a graph on one story, and a map on another story ..."*, and regarding the scatterplot, *"I think it works for me - when it's a big data set and you are trying to minimize it - but what if you are trying to do this with geography ... [such as] all casualties in Iraq...this might be difficult to control ...so you get to a level of sophistication [in the commentary] with it."*

For the second editorial function, identifying the best content to show, experts were in agreement that the *act of discovery* was a function of this stage of production, not to be done in performance. The feeling was summed up by one working anchor, who said, *"[presenters] don't want to stumble around, on the show, looking for video."* And another humorously remarked, *"so let's say that you're not so skilled at the board ... you're coming off a little more miniscule than you are pro."*

As with any temporal medium, experts emphasized the selection of particular content pieces to show depends not only on individual merits of each video or image, but expertise in how the data "dots" will make a dialogue in the flow of the program. Suggestions for adding interest included juxtaposing different types of people (e.g., men versus women), extreme views on either side that could lead to more moderate positions, and opposing political stances. Content that provokes emotion is important in making the data come alive: *"That's what makes data interesting ... the arguments and the human element to it,"* said one working professional.

Show Time

Given the participants' high level of expertise, it perhaps is not surprising that the key finding of the study can be summed up as "it depends." While there were concrete suggestions for improving the scatterplot visualization to support performance, there was less agreement on generalizing how data storytelling might play out in terms of potential program flow, how much storytelling action occurred either behind the scenes or in front of the camera, and the optimal balance of interaction between touch or tangible controls. These decisions, our professionals told us, depend on the type of show being produced and the strengths and preferences of individual performers.

Learning Curve

All participants noted that there would be a learning curve to using the interactive table, when first using the equipment and before each show, whether there was to be a short segment as a sidebar, or if the program featured the table. One participant summed this up by saying *"it's a trained motor skill"* overall. On-air talent felt that there would always be a short rehearsal prior to any show: *"... it's like a symphony, or some kind of choreographed*

[dance]. You are going to have to do this beforehand to figure out which hand is going to do it. Once you've figured out what routine is going to be, I don't think it's really a big deal."

Scripted versus Improvised

"... talent is funny. Some of them are total control freaks, and they want to do everything themselves, and others are like, 'all I want to do is sit up here and read ... don't tell me I have to do something.'"

Many participants agreed, that prior to program, the producer should—at a minimum—provide a rundown of the data and media identified through the editorial process as going on air, with sequences spelled out, and notes on content selected for the on-air performer. From there, the level of scripting could run from completely planned, such as a news read where only a few 9-second bites are featured, to improvised, e.g. a live, hour-long talk show, in which talent could select content based on the flow of the conversation.

Several participants pointed out that a talent's knowledge of the domain from which the data was generated would have a great effect on how much support the talent might desire for data storytelling. The political analyst John King of CNN, who pioneered the use of touch surfaces on U.S. television, was cited as an example of someone who *"you really think you can go to for real information"* due to his relative ease with using touch surface technology and his command of relevant facts without scripting.

Typically, some improvising in television performance is desired, as it increases the liveliness of the program. The dynamic nature of the data visualization was considered a plus in this regard. It was considered visually appealing and enabled the viewer to see how on-camera performers arrived at trends and particular viewpoints. However, many participants felt strongly that it was important to know the story in advance, so that talent could provide their own embellishments without being caught up in figuring out the next "plot point". One person observed, *"the anchor putting their own perspective on the story would come in is when they look at the material [in advance] and they find something interesting ... they find one of those questions and they want to pose it to someone who comes in."*

However, the format of the show will change the equation regarding the level of script support. The ability to improvise could be helpful in some formats, such as a morning talk show, where there are several people on camera at a time that need something of shared interest, for which the table could fill the function. One participant noted, *"One of the hardest things is about interactivity on set. How do you get all of those people on set at the same time doing something together...something they can all look at and talk about?"* But in a show featuring a single personality, using the table for focus could take away from viewers. As an experienced anchor put it, *"how much is the*

anchor going to be looking down ... and disconnected? One of the things you would have to work on is making that [the talent] is not looking away too much."

Hidden versus Visible Actions

"the charm of this device is seeing how you are taking control of it."

Another theme that emerged in our interviews was the degree to which "getting to the point" was on display in the actions of the performer. One serious challenge to using this technology on air is simply the expectation, by many audiences, of receiving information quickly. This has implications for the amount of functionality for direct manipulation featured on the interface. One performer advocated for a simpler design and less flexibility on the interface to support fast-paced performance. A producer repeated this sentiment, suggesting the addition of a "mini-screen" with pre-set views of the data that the performer could switch to with a simple touch.

There were a range of opinions on how much behind-the-scenes human and on-the-screen technical support should be provided to the performer, but most felt strongly the answer was: a lot. The extreme end of this view was one operations person who suggested the tangibles be controlled on the tabletop through remote means. On the other end, a number of people felt that having the talent perform actions was important, *"because the person wants to show the interactivity ..."* However, the way live television programs are directed particularly points out the challenge of transferring "where the action is" to the on-air performer. As one participant mentioned *"so many of the decisions are coming from the control room ... the anchors are just following what they say."* One of the key takeaways from our evaluation, in terms of supporting action on-air, was the need to improve the meta-data preview of the rich-media content provided when the data points are hovered over. Many participants thought key information to be displayed would include: name, age, location, runtime of clip, and a succinct five word summary of the point being made. This enables accurate verbal segues by the talent to the material: *"And now we have Marcie from Michigan who is forty-seven and she disagrees with our last gentleman."*

Tangible versus Touch Interaction

"My first inclination is to touch. That is part of being part of the smartphone culture. "AND"[The tangibles] make it look like a cool, new technology to me - as opposed to this is just a big iPhone."

As the first quote above suggests, the use of touch surfaces has greatly evolved and this study strongly suggests that touch conventions have changed people's interest in and acceptance of tangible controls. Many of our participants could see replacing the X- and Y-axis tangibles with pinch, pull, or swiping motions; they were less resolved regarding the Q and A tangibles. The Tagger tangible, offering a specific function, received little comment. Touch was seen

as more “intuitive,” and one person said the tangibles seem “more gimmicky than anything.” With an emphasis on touch come other possibilities, for example, “the new media [types] would say, how can we draw circles?”

The second quote sums up the predominant counterpoint even the pro-touch participants voiced, that the tangibles provide visual interest and set the technology apart from everyday devices, i.e. their use was more in line with show business. One newperson said “...if I could put this on set and look at it through a camera I would probably have a very different perspective on just the aesthetics of all this ...” Once again, our overall results suggest that the choice of interface is less about usability than the preferences of the performer and desired production values.

Fine Points

The participants offered many suggestions for refining the prototype. Art direction was a topic on which participants’ views diverged greatly. Some participants argued for more intense graphics, while others felt a sparse look would help convey patterns and not overwhelm the viewer. The latter point is directly related to the complexity of a scatterplot graph. While offering great flexibility in information visualization operations, the format received mixed responses due to complexity. As one person put it, “maybe there are too many elements to play with – but I think it makes for good TV.”

In terms of staging, participants thought that the simulated studio set up in our lab, with displays and typical studio camera angles, was well done. They counseled against having guest discussants perform any functions on the table, such as using a tangible to filter. Finally, there is a need to take into account the height of performers in sizing both the table and potentially any tangibles, as one participant had difficulty reaching all parts of the table.

DISCUSSION

During our study, we were struck by the diversity of operational environments, program formats, branding, budgets, personalities, and preferences we encountered, even in our partial sample of television professionals. These diverse aspects form the context from which designers and engineers construct specific problem spaces as they may seek to create effective technologies to support data storytelling for television. Our findings call for attention in tailoring solutions when designing for broadcast production environments and the systems of people and technologies found in each.

Tailoring for the Television Performer

Our system has two main components, a mobile application and an interactive table presentation system, which supports three stages in our model of data storytelling: content gathering, content presentation, and performance. It is the shaping of potential practices in the third stage, performance, that our findings may best inform decisions.

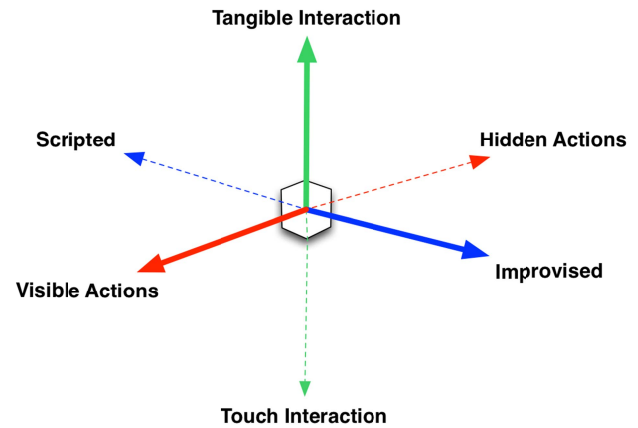


Figure 4. Three dimensions of the Flexible User Profile.

We found in our study a set of tensions in the problem space of designing interactive tables for the performance of media-rich data storytelling. Figure 4 arranges these themes in a 3-dimensional space as a tool to aid designers in working through the preferences of performers and the resources of their supporting environments. We intend for this model to be used to locate performers and their supporting systems along the continuums we identified as relevant to this problem space.

For example, during elections, national television news services often will run programs that remain on-air as results come in; there is a wealth of data to discuss, potentially visualize, and supplement with human-interest stories. This is easily a context in which the producer might decide that a high degree of visible analysis would be desirable. Due to the emerging situation, inefficiencies in improvisation would be tolerable and could even fill time.

Alternatively, daily primetime local news programs are highly structured and rapid-paced, with the need for short segments and less depth. In this situation, the interactive table may be used over a period of evenings to examine reactions to an event, such as a toxic spill, across a range of affected citizens relative to the affected area. In this context, a reporter might use a map visualization with preset views. This set-up would rely more on hidden action (analysis), scripted content, and touch interaction only.

FUTURE WORK

Additional Case Studies

While participants thought our production model was feasible and that the overall concept holds promise, there are limitations to our findings. We were only able to approximate a television studio in our lab and to speculate on how audiences might receive these programs. More study is needed in real production environments to see if the technologies proposed are truly feasible. We would like to produce pilot programs with datasets and test them with potential audiences to refine program scenarios. We also

need to test our design tool for tailoring data storytelling technologies for performers and their environments.

The use of a novel information visualization in our study was helpful in surfacing what our experts felt was missing or what they would immediately think of creating on-air, and this suggested a number of topical areas in television programming to which our practices could be applied. These areas included elections, “*to be able to gather questions from the community and pose them to the candidates,*” sports broadcasting, due to its wealth of statistics; or special news features, “*send the [survey] to the Red Cross ... in refugee camps and ask them to capture what people are thinking,*” to supplement current events, and certainly, in the generation of new types of public opinion data gathering and presentation.

Technical Directions

In terms of technical directions, our participants gave us a number of specific suggestions for each phase in our model of production. For example, we hesitated to limit the length of recorded sound bites during content creation generation, but this is important for saving time later. We also plan to develop additional utilities for the content visualization and editorial stage, including a way to input a quick summary of the content’s main points, whether it is a sound bite or an image with critical information. Performance refinements might include options on the interactive tabletop for using tangible or touch controls on our current visualization, and enriching the graphics according to suggestions.

SUMMARY

To enhance data storytelling on television, it is first necessary to enhance the datasets by including the content elements necessary for television programs. The data must be made visual and plotted. Thus data storytelling should be facilitated at all stages of production: content generation, content visualization/editorial, and performance. To this end, our system for supporting data storytelling combined an experimental mobile survey data gathering application with the creation of information visualizations for interactive tabletop presentation for television. Our evaluation with television professionals validated our production model, but raised important issues about the variability of production environments and on-air talent preferences in terms of program control, visibility of action, and the use of our interactive table. Next steps include refining the production model and technologies and creating pilot programs featuring the use of our studio tabletop for storytelling and audience testing of programs.

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