

**The Journalist as Programmer:
A Case Study of *The New York Times* Interactive News Technology Department**

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International Symposium in Online Journalism
The University of Texas at Austin, April 2010

Abstract

Modern news organizations are using a variety of technologies to assist in telling stories in ways that increasingly combine media, data and user engagement. *The New York Times* is one of the most progressive of these organizations in developing online, data-driven interactive news presentations. An in-depth case study of the practices of *The New York Times* Interactive News Technology department provides insight into the future of Web journalism and suggests some guidelines for other organizations in developing this competency.

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Introduction

The purpose of this study is to gain a systematic understanding of the role of technology in the ever-changing newsroom, driven by the opportunities and challenges introduced by the Internet. Roles within journalism organizations continue to evolve, and now begin to include programming skills, not just to run the business of news but to tell the stories in practicing the craft of journalism. This trend goes beyond combining multiple forms of media: text, audio, video and graphics (known as convergence), and moves into the realm of story creation using information gathering and technical presentation techniques. This involves creating online news packages that access databases, archival documents, photos, audio and video and increasingly provides the opportunity for users to interact with and contribute to the presentation. As these features become more central to storytelling, those with programming backgrounds and/or aptitude are being recruited to fill these roles. Journalists, as we traditionally define them, run the risk of becoming irrelevant without an updated understanding of modern story-creation and delivery methods.

Modern news organizations are using a variety of technologies to assist in telling stories in ways that increasingly combine media, data and user engagement. *The New York Times* is one of the most progressive of these organizations in developing online, data-driven interactive news presentations. This in-depth case study of the practices of the *New York Times* Interactive News Technology department provides insight into the future of Web journalism and suggests some guidelines for other organizations in terms of developing this competency. This study focused on the areas of organization creation and

development, personnel and their backgrounds and training, the culture and processes of the department and their recommendations for integrating these concepts into media curriculum. Newsroom products are shaped by a variety of social and cultural forces (Berkowitz, 1997). This study employs a social meaning of news framework to assess the role of these areas in changing newsroom culture and deliverables.

Review of Literature

The use of computers in journalism was pioneered in the '60s by Philip Meyer at the *Detroit Free Press*, now Professor Emeritus at UNC-Chapel Hill. Meyer used a mainframe computer to analyze the demographics of blacks in Detroit's 1967 riots. This began the integration of computers and social science and was a precursor to the area of computer-assisted reporting (CAR). In *Journalism and Mass Communication Educator*; Yarnall, Johnson, Rinne and Ranney analyzed the presence of CAR techniques in college journalism programs (2008). Computer-assisted reporting encompasses many areas: search for information on the Web, use of commercial databases and archives, database creation and manipulation, statistical analyses and graphic visualization. But, the study found that only about half of journalism programs were teaching spreadsheet and database skills. The study did not address the skills necessary to launch data in meaningful ways on the Web.

Edward Tufte (2001), a pioneer in graphics visualization, has long discussed the link between information design and communication. "Excellence in statistical graphics consists of complex ideas communicated with clarity, precision and efficiency." This could also be a good definition for excellence in journalism.

Adrian Holovaty formerly of WashingtonPost.com used the phrase "programmer as journalist" to define the technical role in news (Niles, 2006). This role has been characterized in various ways and emphases: programmer/journalist, journalist/developer, hacker/journalist, among others. Holovaty was the recipient of a \$1,000,000 Knight Grant in 2007 to develop EveryBlock.com, a hyperlocal news site. That same year, Rich Gordon of Northwestern's Medill program received a \$640,000 Knight Grant to recruit programmers to their graduate program (Gordon, 2008). One of the enrolled programmers, on his blog,

defined the sixth W of journalism: who, what, where, why, when, and *Web* (Brian Boyer, 2008). The Web aspect becomes increasingly important as news organizations struggle to remain competitive and relevant in a multimedia, interactive, social and mobile world.

At the Online News Association conference in Washington, D.C. in September 2008, editors from the *Las Vegas Sun* presented a chart that listed 22 technologies used when redesigning their Web site for interactive capabilities. Those technologies included basic Web techniques like XHTML, Cascading Stylesheets (CSS) and Rich Site Summary (RSS) as well as video editing with Final Cut Pro, but also included programming concepts like Django, Subversion, Flash, Postgres, AJAX and Javascript. This is the new environment of journalism, and people working in the field must become familiar with the capabilities in order to perform at the highest levels.

From a theoretical perspective, understanding newsroom processes and routines has a long legacy in terms of media scholarship. Schudson provided a helpful framework in which to study news that defined three perspectives on the social meanings of news. 1) The political economy which relates to the way news products are shaped by the economic structure of the organization; 2) the sociological organization, in which roles of individuals, how decision-making works and how parties work together are described; 3) the culturological approach, defining broad cultural symbols that are associated with the profession (Schudson, 1993). Ettema, Whitney and Wackman (1987) described similar levels of influence on the media-making process: political economy, organizational and individual. Further, Zelitzer (1993) identified four frames in which to consider journalism: performance, narrative, ritual and interpretive community. These all have to do with the political, social and cultural environment of journalism and more specifically relate to how actors make sense of the workplace, whether it is through negotiation of roles, identification of routines and patterns, making of meaning and decisions and interaction. What all these approaches offer is that news products and ultimate change are not the result of one force or set of forces, but a complete system that encompasses the organization, individual actors and the culture that surrounds them.

New media journalism, or online news, offers a fresh area of study in understanding processes,

routines and culture as they relate to change. News products, fueled by Internet technology, have great potential to change in regard to multimedia and data-driven interactive storytelling, and as such, the actors, organization and cultural aspects of the environment must also change. Chris Paterson (2008) identified ethnography as a critical method in gaining an understanding of the field. “It is our guiding premise that only ethnographic methodologies derived from anthropological and sociological traditions can come close to providing an adequate description of the culture and practice of media production, and the mindset of media producers.” The emphasis is on observation informed by theory, which is the basis of this study.

An important aspect of this study has to do with the constructivist nature of technological innovation. In regard to technology, “there is a social context where they are invented...and a social context where they are adopted, in which users negotiate with the proposed definitions of the technology to adapt them to their needs and to adapt themselves to the requirements of the technique usage” (Domingo, 2008). Online news production of the type under observation here is in its infancy. This study provides an early analysis of one of the premier, innovative organizations applying new practices. Both the research and those under research are expected to continue evolving, and the trends identified are merely a baseline upon which to ground future research in this area.

The culture of technology is different than that of journalism. They each carry different ideas about objectivity, transparency, sharing of information and performance. By merging these cultures, what emerges in terms of a hybrid dynamic? How do the actors, their backgrounds and training, their processes and the organizational structure affect the products they deliver?

Methodology

The methodology for this project is an ethnographic observation of members of the *The New York Times* Interactive News Technology Department. Aron Pilhofer, editor of the department, secured access and permission for the visit. Interviews were held June 22-26, 2009 at *The New York Times* offices. The principal investigator (PI) spent a week observing the department's processes, attending meetings and

interviewing personnel to understand the skills engaged, technologies used and the future goals and requirements of the department. Observation included regular attendance at meetings and shadowing team members as they performed their duties. Physical observation shed light on the application of news values and judgment and process differences from traditional news-gathering procedures. It also indicated the status and proximity to others in the newsroom, providing a sense of the challenges associated with changing newsroom culture and practice. This research is valuable to understanding this role in the future and offers clues to educators on opportunities and challenges in teaching these techniques.

The PI spent a week with the INT department. Each morning, the day began with a meeting, or scrum, as it was referred to by the members. A scrum is a software development term that has to do with an iterative and incremental framework for software development, thus immediately embedding a software development practice into their routines. In this meeting, it quickly became obvious that the content consisted of a mix of tech talk and editorial discussion, seamlessly integrated. The Assistant Editor led the meetings, and they addressed projects that each were working on, as well as traffic and issues involving past projects. Technology issues were addressed quickly and all had a say in solutions. They also addressed ideas or new projects, some of which were not interactives that would run on the Web site, but tools that might help to improve technology processes in the organization. These tools included Puffy, a tool to assist in curating user-submitted photos and Document Cloud, a large project for displaying source documentation that received a sizable Knight Grant in 2009. It is this two-pronged responsibility for all types of innovation that gives this group a unique place in the organization.

Throughout the week, the PI observed the department workings and scheduled meetings with most of the employees, having lengthy interviews (one hour or more) with each of them. Four areas emerged as the most interesting to analyze:

- Background/Education of personnel
- Department Processes
- Department Culture

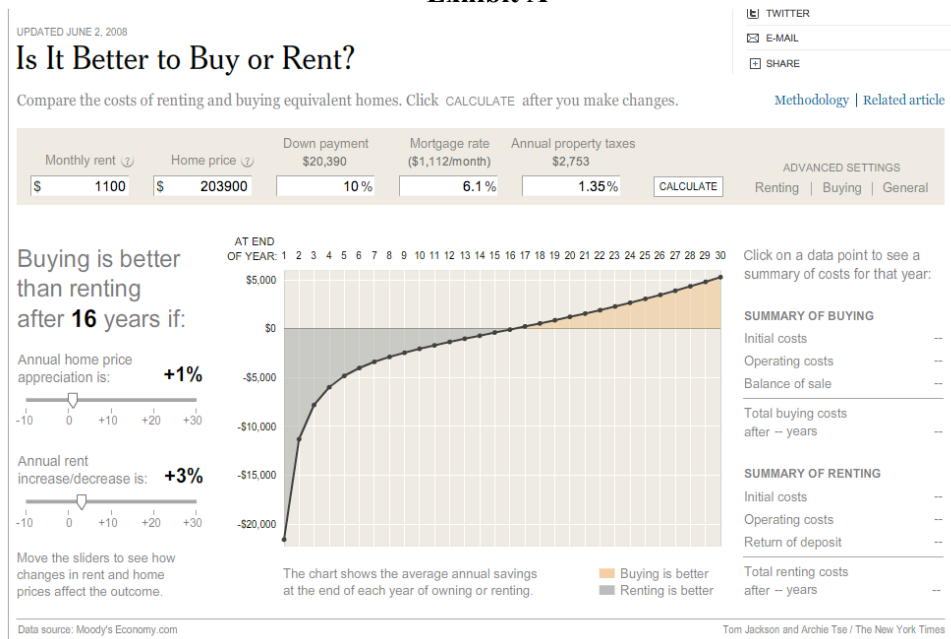
- Recommendations for integration into media curriculum

Other than identifying Pilhofer as the department lead, the other members of the organization were promised anonymity in their responses, to assure the most candid assessment of their perceptions. The quotes in this article were all generated by one of the members of the INT team.

The News Product – Data-Driven Interactives


The INT department's primary charge is in making news products that engage the user and that often use a database to populate the information. The data come from a variety of sources or can be the result of user input. These presentations can include interactive maps, visualizations, timelines and graphics. The *New York Times* is a particularly innovative organization in this area, with numerous interactive features on the Multimedia section of their Web site that supplement and enhance traditional articles, or that stand alone in their ability to tell stories. For example, the interactive feature entitled “Is It Better To Rent or Buy?” illustrates this capability. The interactive chart populated with Moody economic data allows users to input their own information: housing appreciation and rental increases/decreases in their market. The accompanying article is an opinion piece of one person's real estate decision. But, the interactive offers each user a tool to customize his or her own decision, offering a personal and local aspect to the story.

Exhibit A



At the time of the PI's visit, the activities the team was discussing included a project on water quality which has since won a medal from Investigative Reporters and Editors (See Exhibit B), one on New York City school test scores (See Exhibit C) and one that would complement the upcoming New York City Marathon (See Exhibit D). The interactives exhibit the characteristics of clean design and easy user input, often with only one or two fields the user can manipulate. Graphics are mostly self-explanatory, with little needed in terms of instruction in order to use them. Interactions are often non-linear, offering multiple ways a user can navigate through a presentation, which can result in a great amount of time an individual spends with each presentation.

Exhibit B



Toxic Waters

A series about the worsening pollution in American waters and regulators' response

[SHARE](#) | [FEEDBACK](#) | [E-MAIL](#)

Overview

Browse by state:

| | |
|----------------------|----------------|
| Alabama | Missouri |
| Alaska | Montana |
| Arizona | Nebraska |
| Arkansas | Nevada |
| California | New Hampshire |
| Colorado | New Jersey |
| Connecticut | New Mexico |
| Delaware | New York |
| District of Columbia | North Carolina |
| Florida | North Dakota |
| Georgia | Ohio |
| Hawaii | Oklahoma |
| Idaho | Oregon |
| Illinois | Pennsylvania |
| Indiana | Rhode Island |
| Iowa | South Carolina |
| Kansas | South Dakota |
| Kentucky | Tennessee |
| Louisiana | Texas |
| Utah | Vermont |
| Maine | Virginia |
| Maryland | Washington |
| Massachusetts | West Virginia |
| Michigan | Wisconsin |
| Minnesota | Wyoming |
| Mississippi | |

[About the Data](#)

What's in Your Water

The 35-year-old federal law regulating tap water is so out of date that the water Americans drink can pose what scientists say are serious health risks – and still be legal. Examine whether contaminants in your water supply met two standards: the legal limits established by the Safe Drinking Water Act, and the typically stricter health guidelines. The data was collected by an advocacy organization, the **Environmental Working Group**, who shared it with The Times.

• Read the story: Tap Water Can Be Unhealthy but Still Legal

Browse systems in your state ...

... or view the largest water systems in the nation

| | |
|---|---|
| <p>1. New York City-Catskill/Delaware System Bronx County (Serves 6,552,718 people)</p> | <p>2. City of Los Angeles, Dept. of Water & Power Los Angeles County (Serves 3,828,700 people)</p> |
| <p>3. Chicago Cook County (Serves 2,896,016 people)</p> | <p>4. City of Houston Public Works Dept. Harris County (Serves 2,700,000 people)</p> |
| <p>5. San Francisco Regional Water System San Mateo County (Serves 2,500,000 people)</p> | <p>6. Miami-Dade Water and Sewer Authority - Main System Miami-Dade County (Serves 2,100,000 people)</p> |
| <p>7. Massachusetts Water Resources Authority Suffolk County (Serves 2,000,000 people)</p> | <p>8. Washington Suburban Sanitary Commission Montgomery County (Serves 1,800,000 people)</p> |
| <p>9. Baltimore City Baltimore City County (Serves 1,600,000 people)</p> | <p>10. Philadelphia Water Department Philadelphia County (Serves 1,600,000 people)</p> |


Source: The Environmental Working Group ([About this data](#))

Charles Duhigg, Matthew Ericson, Tyson Evans, Brian Hamman, Derek Willis

ALSO IN THIS SERIES »


Clean Water Act Violations: The Enforcement Record

The New York Times surveyed violations of the Clean Water Act in every state, and the response by state regulators.



Tainted Tap Water

In Maywood, Ca, located near downtown Los Angeles, tap water often comes out brown and contains harmful levels of dangerous chemicals.



Water Polluters Near You

Search data on more than 200,000 facilities around the nation permitted to discharge pollutants.

Exhibit C

New York State Test Scores

[SHARE](#) | [FEEDBACK](#) | [E-MAIL](#)

Test scores have improved in New York City and throughout the state. This tool will help you see how your local school and district compare. Test data since 1999 was merged into a single database, and passing rates and average scores were converted to percentile rankings to put scores into better context. You can see the performance history for more than 3,500 schools and 700 districts.

[Related Article: New York Test Scores Rise, but Criticism Continues](#) | [Share your thoughts](#)

Overview

New York City

Search:

Search

Counties:

Counties ...

Top Ranked Schools in New York City

1. **New Explorations Science, Technology And Math School**
N.Y.C. Geographic District 1
2. **Anderson School**
N.Y.C. Geographic District 3
3. **P.S. 188 Kingsbury**
N.Y.C. Geographic District 26
4. **P.S. 203 Oakland Gardens**
N.Y.C. Geographic District 26
5. **The Scholar's Academy**
N.Y.C. Geographic District 27

Top Ranked Schools in New York State

1. **Lakeville School**
Great Neck School District
2. **Greenvale School**
Eastchester School District
3. **H C Crittenden Middle School**
Byram Hills School District
4. **Briarcliff Middle School**
Briarcliff Manor School District
5. **Milton School**
Rye School District

Large Districts

1. New York City
2. Buffalo School District
3. Rochester School District
4. Syracuse School District
5. Yonkers School District

Data source and methodology Tyson Evans, Robert Gebeloff, Andrei Scheinkman

Exhibit D

Edit profile

Cindy
Austin, TX

1-4 of 6

Running Experience Beginner

The Galloway Training Method

Jeff Galloway

Runs per week: 3

Weekly miles: 8 to 30

Longest run: 26 mi.

[View details](#)

New York Flyers Marathon Program

Glen A. Wiener / Brian Hsia

Runs per week: 5

Weekly miles: 22 to 48

Longest run: 20 mi.

[View details](#)

Team for Kids Marathon Program

Frank Handelman

Runs per week: 5

Weekly miles: 19 to 42

Longest run: 22 mi.

[View details](#)

McMillan Running Race Ready Program

Greg McMillan

Runs per week: 3 to 5

Weekly miles: 3 to 29

Longest run: 18 mi.

[View details](#)

The Galloway Training Method Jeff Galloway - 21 weeks

This plan is right for you if...
You are a new runner with little or no experience, particularly if you have struggled with injuries, are older or are seeking a less grueling training method.

About the coach
Jeff Galloway, a member of the 1972 Olympic track team, is the author of several books on running and conducts marathon training groups around the United States.

Philosophy
The goal is to get the runner to both the start and finish lines injury-free by incorporating regular "walk breaks" during training runs and the marathon itself.

About the training
Two 20- to 30-minute runs on Tuesday and Thursday, with long runs on the weekend. Every run includes regular "walk breaks" to allow the body to recover during the run and lower the risk of injury.

Start Training:

End of Training:

[Save plan and finish](#)

Distance Runs

Timed Runs

A particularly creative use of technology has to do with the WordTrain visualizations that The New York Times has pioneered. These interactives ask users to input a word and select one or two characteristics. A visualization was done after the 2008 election, asking users to express how they felt, and then provide party affiliation. A second visualization asked for users to provide a word that describes their feeling about the economy and then provide their employment status (See Exhibit E). These simple tools provide a way to crowd source a topic, gaining a sense of the mindset of the populace.

Exhibit E

« MORE FEATURES E-MAIL FEEDBACK

Living WITH Less The human side of the global recession

Enter the word that best describes **your current mood** about the economy. You can submit a response once a day. This page will update with the most popular choices from NYTimes.com readers.

Type a Word or Select a Word April 10, 2010 ?

I am currently Employed Unemployed Neither

Everyone **Employed** Unemployed

confused confused
inspired inspired
outraged defeated defeated
upset jobless upset jobless jobless
hopeful relieved indifferent relieved indifferent

Gabriel Dance, Aron Pilhofer and Andrew Kueneman/The New York Times

One can find numerous examples of this type of storytelling on the New York Times Web site, mixed in with other presentations on the Multimedia page (<http://www.nytimes.com/pages/multimedia/index.html>).

Department Creation and Background

In 2007, Pilhofer and Matt Ericson, deputy graphics director at *The New York Times*, made a proposal to create the Interactive News Technologies (INT) department. The goal was to assemble a group of developers/journalists doing projects on a variety of topics, cutting across all desks (Nussbaum, 2009). The roots of the proposal were in computer-assisted reporting, but the vision was to reduce the bureaucracy associated with creating each project and to elevate the status of the coders in working with reporters and editors. The department would require a group of special people, those who were as fluent in journalism as they were in coding, who could understand the editorial needs, develop the functionality and engage users. The department started with two employees, Pilhofer and a software developer, but has grown to eleven in three years. In addition to Pilhofer, who leads the department with the title of Editor, there is an Assistant Editor, a Senior Software Architect, three with the title Interface Engineer (one of which is co-located with the graphics department), four Software Engineers and one Information Architect (who actually works for the design department but has matrix responsibility and is co-located with the INT team). While these titles are seemingly geeky and reflect their technology roles, their actual responsibilities are much broader and encompass a stronger editorial emphasis than the names indicate. And, it should be noted, that in 2009 during the PI's visit, each of these positions was filled by a male. Later in the year, the department hired its first female employee, a highly experienced coder. The gender implications of the technology field will be addressed later in the paper.

The team performs projects of varying terms and cover a broad range, including politics, sports, investigative reporting, entertainment and pop culture. They interface with departments across the organization, but their primary contacts are with design, graphics, multimedia, investigative reporting and the sports desks.

Background/Education of Department Personnel

One of the most notable aspects of the analysis was the wide range of resources that had been assembled to create this department. Counter to conventional wisdom, simply selecting people with

strong technical skills was not solely what was needed to achieve the goals of this group. Developing news interactives and technology tools to assist journalism functions is very different than the projects typically engaged by a software developer, like programming the moves of a robot, designing an enterprise-level accounting system or even developing the functionality of a content management system. While definitely seeking strong technical expertise, the department sought and hired people with a passion for journalism, an interest in telling an important story and the ability to work across departments. These are not necessarily traits that automatically come with someone from a computer science or software development background. An assessment of a potential employee's interest and enthusiasm for storytelling had to be made based on past projects, the kinds of things the candidate did in his or her spare time and how he or she interacted in the interview process.

Many in the department did not have traditional technical educations. Undergraduate degrees were varied in Art & Design, Anthropology, English, History, Urban Planning, Rhetoric and of course, Journalism. Only two had done extensive educational preparation in a computer-oriented field, and another two had received technical-oriented minors in support of liberal arts degrees. Most had either taken up computing on their own at a very young age or had gravitated toward it due to necessity for a specific job.

The previous experience of the team members is also quite varied. Most have worked in journalistic settings before, including the *Las Vegas Sun*, *the Washington Post* and the Canadian Broadcasting Company or held other positions at *The New York Times*. A few had worked for technology companies or Web startups, but most had been involved with organizations in which content was a key part of their offering. Several mentioned working on their high school or college newspapers, even though they had not necessarily been journalism majors, highlighting the importance of college media experience to future career decisions.

Most described their skill acquisition as “self-taught.” Some of the statements from employees that supported this concept included:

- “Pretty much anybody I know who has done well in programming taught themselves about it.”

- “Everybody on our team is kind of self-taught and is able to just learn and has the curiosity and interest to just pick up what they need to know.”
- “I basically started fooling around with it on my own before I started here.”
- “The best way to learn an Internet program is, happily, on the Internet.”
- “All the technical stuff, I learned on my own. I did a bunch of Web stuff for little projects I was doing. I basically made a site for any extensive project I did when I was in journalism school. It was fun, but it wasn't part of the education I got there.”

One of the main technologies the team uses is a Web framework technology known as Ruby on Rails. It is a rapid application development environment based on the Ruby programming language that allows the hooks between interface and database to be quickly created. While RoR skills specifically were not required of new hires, most had worked in an environment where they were introduced to object-oriented programming concepts. Knowing the specific language prior to being hired was not as important as understanding the application development process and having an innovative spirit and the ability to learn.

- “More than half our team members didn't know Ruby on Rails before they started here.”
- “Every language, every framework has its nuances. Most of the best practices I know for all objected-oriented programming, I learned from a guy I used to with at a company that used Java. There's a lot of commonality.”
- “The people who come from good programs have good minds and are language agnostic. It's really more about the concepts inherent in the language.”

The members of the team understood that the combination of skills in the department were rare and would be in demand in the future.

- “It's hard to find people who have the specific skills for this job.”
- “News organizations are starting to hire CAR (computer-assisted reporting) people with a specific intent of putting that data online. They are asking for that kind of experience or skill, and the pool is exceedingly small. So what happens is we end up fighting over the same people when jobs open up. When we say we want people with experience doing that, its the same five people who get calls. “
- “It's a growth area in terms of absolute need. The reason it's not more popular is because many of the folks doing the hiring don't yet understand the need or what it is they are hiring. When

budgets are shrinking, its very easy to say I know what reporters and editors do. I need those. When it comes to this area, they have done without for so long, so they feel they can do without it now.”

The idea that these were people bringing a unique journalistic perspective to the development role as also mentioned by several.

- “Everyone on our team definitely gets the journalism part.”
- “I love the journalism pieces of it. I was building things and seeing it on the Website and getting feedback and making it better.”
- “We need somebody who is going to be a good software developer and can think about the journalism side of it.”
- “When I was hired, they definitely cared about how much I was interested in journalism and what my ideas were for projects.”
- “These people are like hybrid journalist/computer people; the programmer/journalist, which is the vanguard of the field.”

The environment is very team-oriented. The daily meetings offer a place where members can bounce ideas and help solve problems. As I spent time with the group, I saw some working together, explaining concepts or just working through problems as a team. This is as much a process feature as it is a training and development feature. A common theme was a drive to solve problems and to find tools to do so. Some indicated using online resources, such as tutorials, others indicated that they had friends who could help them solve computer-oriented problems and others said they found internal resources to help them through any issues once they were on the job.

Some stated the learning was based on a need, and that it was done in context. “I didn’t love programming when I first came to it. I saw it more as a means to an end.” This is a key element to understanding the role of technology in journalism. It has more to do with presenting technology in a communication context or solving a communications problem than it has to do with basic functionality or straight coding. Each member of this team understands their role in making decisions that affect the ultimate nature of the story.

Process

Prior to visiting the group, the PI sent out a short survey to the members to gain some background information. One of the questions was “Briefly describe what you do at NY Times (basically your elevator pitch or what you tell people at cocktail parties when asked).” The purpose was to see how they each defined their role. The responses were varied. Some spoke in terms of the journalism products they produced:

- “I’m a journalist/designer/developer of data-driven applications on news-driven deadlines.”
- “I develop interactive, news-related features for nytimes.com, with a focus on politics.”
- “I tell people that I help collect data and use it to build web features/applications/sites for *The New York Times*. I try to name some specific examples around a content area (Congress, etc).”

Some defined their role in terms of the interaction and collaboration with other departments:

- “Work with reporters and editors to conceive and build news-oriented web applications.”

Some view their role as broadly innovative, providing technical expertise across the organization:

- “I tell people I make special projects for *The New York Times* website. If they’re still interested, I tell them a little bit about how we’re trying to treat the web as a first-class medium (rather than just a delivery mechanism for other mediums) and push the limits of how we present and interact with news online.”
- “I suppose you could describe me as a backfield editor for our web applications. I tend to work on the back-end parts of systems, integrating our applications with systems elsewhere in *The New York Times* and spot-checking applications and mentoring in best practices.”

The department was founded to reduce bureaucracy and introduce flexibility in the process of creating each project, so the group could react more like a reporting team than a support organization.

This requires people who are comfortable in an environment where the individual has control of their projects and must be the source of their own guidance and direction.

- “We tend to have very little process. The group was formed as a counterbalance to the incredibly process heavy, very long timeframe normal development process that was in place.”
- “The department was initially designed to be very light on process and fit within the story and news cycle and work with desks and be flexible with deadlines and change.”
- “We treat everyone like reporters, saying this is your project. You do it, and then tell us what

needs to be done to represent it.”

- “It's a very individually driven job. Nobody is going to tell you exactly what to do on your project. There's not going to be a clear set of requirements or deliverables or deadlines necessarily. It's really that somebody comes to you and says you tell me what you want to do, you tell me how long it's going to take and what needs to be done.”
- “Every single project that you do is a little bit different and you just have to have good people to make it work.”

Some projects take the entire resources of the team, like the Olympics project, which was large and of a timely nature. The team works on these projects over time, but when the deadline comes to fruition, it's all hands on deck. But most weeks, each individual is working on his own project autonomously or engaging specific resources, like the involved desks.

The genesis of a project can vary:

- “Half our days come just straight from stories. So, both the water and schools projects are stories that originated in different desks, one from education one from business. They came to us and said, 'we've got this story, we've got a lot of data, is there something you guys can do?’”
- “There's the second class of project where we'll recognize a need, so it'll be more of a tool-based rather than a story-based project, like the document reader or the Q&A application, where someone will come to us with a specific issue, but we will see that there's really a larger application of it.”

And some projects are simply what they called event-based, when there's an activity going on like the Academy Awards or NCAA March Madness, and something needs to be done to represent it with data.

One might imagine that this group would easily be overwhelmed by multiple requests for their involvement. There are decision points in engaging any project. The team does some assessment as to whether they can actually execute a project, whether the data exists and is worth the effort. When conflicts arise, they appeal to other editors and executives to determine the profile of the project, indicating a willingness and need to work within the larger political structure of *The Times*. Deadlines are considered. Projects that originate in the INT group have much more flexibility than those that are brought to them by one of the other desks.

A project typically has at least one front-end and one back-end person assigned to it. Front-end responsibilities include design, user experience and associated technologies, like HTML, CSS and

JavaScript. The back-end person will handle things like scaling and data manipulation. Both involve working within the Ruby on Rails framework, although a few projects have used another Web framework, Django, which is based on the Python language.

These roles are often fluid, based on the interests of the personnel in the group. “We are trying to integrate that more, because all of the back-end people work here because they have either a journalistic background or are interested in that. It's not that we have straight coders who are interested in sitting there and just coding.”

A project starts out with a design or a “wireframe” and the user constraints are defined. Wireframing typically occurs in a graphics program like Illustrator or other design program, in order to immediately engage the visual aspects of a project. The wireframe gets a full review, by editors, others on the team and the associated desks involved in the project. Once the wireframe is complete, the site is built out, and depending on size, it is staged on a Web server and tested.

Development happens on laptops or desktop computers with change control software used to organize multiple team members working on the same project. The project management program Basecamp is used to manage the range of projects. *Times* servers are used for anything a user sees on the site, but the department decided to use Amazon EC2 servers for out-facing items, like certain database functionality. This is one example of the department having the flexibility to make these types of decisions and to use available tools, often from external organizations or open-source environments, to solve problems.

While the lack of process is a benefit, there is some understanding that, as they grow and implement more projects in terms of quantity and complexity, that a balance must emerge. “The immediate challenge that we've been talking about is figuring out the mix of process and flexibility. We're now integrating more process and trying to figure out where the sweet spot is.”

Culture

Part of the success of this team comes from the culture that has been developed in the department, the roots of which are in creativity and innovation, driven in many ways by the open-source or hacker culture. This mindset is something that is infiltrating the entire *Times* organization and is recognized as important to future success.

- “*The Times* culture has really shifted to where innovation is front and center and bold, and all the way up to the top.”
- “I think that's something that *The Times* has done, probably pretty amazing for a lot of these other media organizations, when they first started opening up a lot of these API's (application programming interfaces).”
- “I think we are all really pro open source. We prefer to use open source tools, and we are happy to do that.”
- “In my mind, the open-source concept is definitely predicated on this notion that sharing is more powerful.”

There is a sense of excitement in the group that resonates through many of the comments. “If there was something really dramatic happening today in the news, this team could come up with some really interesting things by the day's end. So that kind of fire power, that's what I'm most interested in. I think this team is in a really interesting position to be poised to do things, whether it's the Olympics, or the Oscars, or Puffy, or the way we handle user submissions, to really start creating tools that can be used widely and aren't specific to just one event or one narrative, to build these tools that are really adaptable.”

Part of that excitement may stem from their ability to bring their own personal interests to projects that the department selects. One self-described sports junkie said of the propensity toward non-investigative stories to be supported by data, “I'm glad to see it's not all investigative reports, that it is branching out. Because there are things out there that are interesting that involve data that aren't investigative at all, but people are still interested in them. It's sort of a natural thing, particularly with sports.”

But much of the excitement has to do with the opportunity to work with an elite group at *The Times*. “I love it. I think they are smart. I just like being around challenging, smart, interesting, driven and

hardworking people.”

Another key to their success is in their ability to manage large collaborations with other departments. The team is highly integrated across the organization and is interested in providing education to broaden their impact.

- “I really, honestly believe that the stuff that really sets us apart is big collaborations that we do with the graphics department. Nobody does that stuff. At least no one does to this extent and depth.”
- “Walling off the different departments in the news room is going to be the death of the media.”
- “The idea of having people who don't know how to develop software designing and specifying software for others to develop is not a successful model in general. That's not how Google does it, that's not how successful Web shops, places that generate a lot of innovation, do it. My hope is that as we continue moving in this direction, that we have better training for the groups with which we collaborate.”

The last statement reflects a cognizance of the ways in which innovative, tech, media companies are running their businesses, and how that might relate to the role of a newspaper company. This attitude is necessary in changing the attitudes that have traditionally originated in the CAR environment or just the general proprietary nature of the journalism field.

- “The people who did data by and large didn't do design for a good reason. It's rare to find somebody who does both. So for an investigative or CAR story, you need at a minimum, someone who can do the data analysis and write the story, or at least do the data analysis and explain the data analysis to someone else who can write the story. But for a Web application that involves data you need someone who can do data analysis and somebody who can put it online.”
- “Another factor is that the tools to put data online, up until recently sucked, or they were prohibitively expensive and just bad. So, most CAR people have had the experience somewhere along the line of doing the data analysis, but then they give it to someone else and that person totally screws it up.”
- “It's important to not feel the need to clutch on to the content, keep it close to you. For example, the Runwell Project that we just did, There was some initial concern that we were offering a calendar to work on schedule, and we wanted to add a feed that you could subscribe to, Google Calendar, or iCal, or whatever. There was some concern that people would be less likely to come back to the site if they had a calendar that they could use out of the site. I think just being flexible enough to say, 'if it's good, people are going to come back to use it. So make it as good as you can.’”

The Times obviously has a head start on developing this type of expertise that other newsrooms will be seeking to acquire. It won't be easy. There will need to be acquisition of the correct number of

qualified resources and to properly establish their roles in the organization.

- “I think it would be very difficult to do any number of these projects without 2 or 3 people. There's no one person that has enough skill that can do it as a one-man band, without killing himself.
- “So, you really need 2-3 people, and with that you are only getting a project a month, every six weeks, so really low output.”
- “You are looking at 4-6 months just to get everything set up, to figure out the newsroom relationships.”
- “There's the technical component. You have to set up all the infrastructure, which takes a long time. From booting up the servers to getting all your admin setup, there's just a lot. Then getting familiar with editors and building their trust to get involved with projects early enough. That's not a small task to set up.”

Journalism/Media Education

While the members of the team had strong opinions about their roles and processes, they were less direct in addressing how journalism education could develop these competencies in future graduates.

There was a general opinion that understanding the Web and how it works, as well as a general approach to problem solving, should be foundations of media education.

- “It's more that you will find someone who comes in with the curiosity and the technical aptitude. You can teach them journalism, but for the majority of the people, it's really teaching them the Web and fluency with this kind of stuff.”
- “I think the most important thing is to have someone who can learn new skills.”
- “It's someone who sees problems and figures out ways to solve them.”
- “It's problem-solving. I would rather give someone something and have them figure it out.”
- “Having someone who can actually code is probably the best position. But, I think just having a good understanding of the Web, how things work on the inside, is important. There's definitely people who don't really get it. They don't understand the concept of a hyperlink or the difference between a blog and an online news site. There seem to be some basic concepts that maybe not all people fully get.”
- “It seems that you teach technical aspects of photography in journalism classes and shooting the technical aspects of video. The technical and aesthetic aspects of photography or video play into a journalism program, so that is probably not that far off from how I would imagine seeing the integration of data and programming.”

It was recognized that this was an area of growth potential and that there would be jobs for people with these skills in the future. And that the key was finding people who were passionate about the topic and have the ability to learn.

- “There are more jobs for producers who are fluent in the Web, who understand how our projects work and what are some of the issues in terms of timeframe and complexity and how we need to work together.”
- “So instead, go create your own path. I mean, those are the people who are really succeeding. *The Times* has hired a lot of them. You take people who either have a great focus on a niche, whether it's something like television or a geographic niche, or community, or a way of storytelling. You focus on something that makes you passionate and just drive it, you know.”
- “The passion thing is huge.”
- “Innovation should happen on it's own. You are going to continue learning. If you're really excited about the Austin music scene, and you're really passionate about it, the cost of competing is so low now, you can easily become the dominant voice.”

One member of the group spoke more fundamentally about the ways that journalism engages data in general. The profession has not been strong on retaining institutional knowledge or organizing content in a way so that it can be used more efficiently over time. If journalism schools are driven by the profession, then they will be limited in their ability to be successful in this area.

- “I think at a more fundamental level we have to rethink and re-teach how we deal with and how we teach students to deal with, information.”
- “You have a sort of responsibility to knowledge in general to treat information as if it actually had the value that we claim it has. Information deserves to be treated like it has value.”
- To some extent, it is about exposing people to new concepts and ideas, and once again, the ability to self-teach and to engage in continuous learning.
- “For professionals and students, sometimes you don't even understand how the mechanics of how something comes together. So, it just becomes foreign and it's opaque, so you give up trying to understand.”
- “To actually understand the logistics of it, I think, makes it much more interesting. That way, when they find that passion, they can at least have enough of an understanding of how to pursue it.”
- “Sometimes you have to know what you don't know.”
- “I don't think any of your students are going to leave school being programming experts, or ready for some of those technical positions, but I think more than anything, almost everything I've learned, I learned on my own. Even when I was in school, the attitude was always, never say you can't do it. Never say “no.””
- “Like we were talking about this morning in the meeting, you have to cultivate this hunger. It sounds cheesy, maybe, but I'd stay up until 3 or 4 in the morning doing something totally ridiculous, and it was just because I wanted to figure it out. There's sort of this passion and drive to figure it out, to make it work.”

At the time of the PI's visit, the entire team, including its leader, were male. Since then, one female employee has been hired. Each member of the team expressed a sincere sensitivity to the issue and a recognition of the importance of having a diverse team. However, they were unclear how to overcome the dearth of women who possessed the skills or had an interest in programming. This is not a problem solely related to this team at *The New York Times*, but seems to be an issue in the tech world, not unlike other tech startups. Several indicated that they often work with female multimedia producers or reporters in developing the interactives, so the female perspective is not completely absent.

- “There's just not a lot of women out there in these roles, at least that I've seen. But for design, there's a fairly large population of women doing it. If it's only men designing the user interactions with these projects that we're spending huge amounts of time on, you get a very narrow opinion.”
- “The bigger thing is that the world of software development is both male-dominated, but also tends to be dominated by a certain kind of person. There's a certain kind of person who can do well in the software world that couldn't do well in other areas.”
- “I think the problem is that the divide goes back so far that when we meet people, they tend to be guys. We will go to conferences, and there will be few women there. We'll descend on the few women, start talking about jobs and then overwhelm them.”
- “We have incredibly specific skills that we are looking for, and so, in many cases, there is really only one person out of the 20 we've identified that really fits. Finding a woman within those constraints is difficult.”

Obviously, the high enrollment of women in Journalism and Mass Communication programs presents both opportunities and challenges. The opportunities exist in being able to present technology tools and concepts to a female audience, thus increasing the representation of women in the field. The challenge will be in gaining females' interest in such an activity, with the hope being that as it relates to a communications context, women may be more likely to gravitate toward it or to want to be associated. There are bigger issues to be dealt with here, regarding the culture of technology, but as hybrid communication/technology environments develop, perhaps some solutions will emerge.

Conclusion

Obviously, one of the key ingredients to the success of this department is in its leadership. Aron Pilhofer conceived the group, manages its operation and hires and allocates its resources. He provides an external face for the group by being active at conferences and has written successful grant applications. It is clear that strong leadership, in someone that can make things happen, but can also effectively delegate responsibility, is necessary in this environment. A leader of this nature must also be able to generate trust across the organization.

“He’s a real catalyst for action,” said one of the team members of Pilhofer’s style. Perhaps that should be another characteristic of a strong leader. In an environment in which change is given and innovation is an expected part of the job, it will require a leader who is not only flexible in dealing with change, but one who can influence it. It is ultimately this ability to propose change and assemble and manage resources that determines the ultimate success or failure of future operations of this kind.

The skills of this department may seem to run counter to those of traditional journalists, who stereotypically have not been known for math or technology expertise. However, this area has always been necessary to journalism, in reporting on budgets and financial stories, or in using data in a computer-assisted reporting environment. Perhaps the ability to tell stories in this manner will launch a new interest in computational journalism, and perhaps it will attract different types of people to seek journalism degrees and careers. These different types of people, coming from different backgrounds and cultures, will surely influence the culture of news.

While *The New York Times* has one of the most extensive organizations in this area and has amassed a great many projects, a few other organizations have been doing meaningful work with data-driven interactives, including The St. Petersburg Times with the Pulitzer Prize-winning Politifact, a site that measures politicians performance against campaign promises, as well as *Washington Post*, *Las Vegas Sun*, *Minneapolis Star-Tribune* and *Los Angeles Times*. It is a small, elite group, thus demonstrating the vast potential for organizations who can develop these competencies. Organizations must weigh the cost and time to develop this expertise against the proposed deliverables, all in an economic environment that

is not terribly flexible nor encouraging of innovation. But the value of the information products often speaks for itself.

While the interviews provided great insight into the perspectives of the employees in the group, being on hand to observe the day-to-day processes and interactions was invaluable. Watching them sitting at their desks, working on computers, talking on the phone, interacting with co-workers and attending meetings, all in the context of developing journalism products, one gets the sense that their roles are not unlike those of a traditional journalist, reporters and editors using technology tools to create stories. But, instead of using Word to craft their stories, or Photoshop to crop photos for a slideshow or Final Cut to edit a video package, they are using a different set of tools. They bring as much passion to the role of storytelling as their counterparts in other departments, but also view their role in terms of the innovation their products and services contribute to the organization.

There are great challenges ahead, not only for the profession, but also for the educational disciplines that support media. Finding faculty who have the interest and inclination to learn programming and data skills will not happen quickly, and programs will be slow to add courses or shift their emphases into this area. The first step is a recognition of the value of incorporating these skills into a program, seeking those with any expertise in this area as recruits and encouraging innovation throughout the curriculum. Students need to gain a sense that there is much to be learned on one's own, and that they should develop the curiosity and initiative with which to support an industry that will be defined by change and innovation going forward.

Obviously, a short-term visit has its limitations in terms of gleaning representative or generalizable data. But ethnography is an extremely valuable method in gaining a comprehensive understanding of new systems and processes and will become more critical as the field continues to evolve. Ethnographies of this nature can provide a basis for comparison across organizations or can offer background or a baseline upon which to justify quantitative methods. While it is difficult to gain access, set aside the time and secure resources to fund a more extensive visit, spending longer amounts of time in the newsroom and possibly integrating the researcher into some of the processes is recommended for

future research in this area. Other areas that will provide fruitful in terms of future study would include assessing the specific news products that come out of these processes and the perceptions and behaviors of users who engage with them.

The researcher owes a great debt of gratitude to the Interactive News Technology department at *The New York Times* for allowing flexible and unfettered access to its resources. The members of the team who spent a large amounts of time providing candid and thoughtful responses to questions are greatly appreciated. Their input is absolutely critical to an improved understanding in this area.

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