

Interactive Graphics Development (IGD):

A framework for studying innovative visual story forms

Abstract:

There is considerable scholarship defining unique features of digital storytelling and on interactive content for online newspapers. However, little scholarship exists that provides theoretical and practical analysis of the creation of interactive graphics. This paper establishes the Interactive Graphics Development framework, a theoretical model for researchers studying the effectiveness of interactive graphics and their potential in storytelling. The IGD also standardizes definitions for interactive graphics and provides a touch point for journalists refining nonlinear storytelling.

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Introduction

The number of unique visitors to news and information sites grew 9.25 percent in 2009 (Pew Center for Excellence in Journalism, 2010) and three-quarters of U.S. adults (nearly 171 million people) told researchers they read a newspaper, either in print or online during the past week (Scarborough Research, 2009). However, there is cause for caution; younger readers are increasingly dissatisfied with traditional news delivery and prefer nonlinear storytelling forms in greater numbers than those who are older (Jones, 2009).

This trend isn't surprising when one considers that "digital natives" – those born in the 1990s and beyond – think and process information differently and are maturing in a world full of digital cameras, computers, cell phones, and video games (Prensky, 2001).

"Digital Natives are used to receiving information really fast. They like to parallel process and multi-task. They prefer their graphics *before* their text rather than the opposite. They prefer random access (like hypertext). They function best when networked. They thrive on instant gratification and frequent rewards. They prefer games to 'serious' work" (Prensky, 2001, p. 2).

What is surprising is that journalists are not fully addressing this trend and capitalizing on it to build their future audience. The 2009 State of the News Media Report from the Pew Project for Excellence in Journalism reported that when online journalists were asked what the Web does particularly well, 91 percent of respondents named some aspect of technology such as interactivity and data visualization. However, only 16 percent cited new forms of storytelling **and just 12 percent mentioned reporting depth.** (Pew Project for Excellence in Journalism, 2009). In short, journalists are focusing on the technology itself rather than on how best to use it to tell stories and add context. This is a serious

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disconnect for journalists who should be using techniques such as interactive graphics and nonlinear storytelling to deliver quality content to evolving audiences.

Yaros (2009) suggests that journalists should create new structures for online news and posits that they should strive for contiguity – a process by which journalists strategically add multimedia elements at the place that they are most relevant in a story and most useful to the consumer. This paper will propose a similar approach be applied to the creation of interactive graphics. Some editors have argued that newsrooms should not devote resources to interactive graphics because they often require a large time commitment and specialized skills, and in the end, the resource drain is not worth the payoff. In other words, interactives often don't equal increased "hits" on the Web site. According to Scott Goldman, Senior Editor/Visuals at *The Indianapolis Star*, “There's a huge push-back on how much time and manpower it takes to create interactives. There are also issues with the metrics. A lot of sites don't know how to count Flash graphics. ... They see, say, 1,000 page views on a graphic that took a week or more to complete, and ask, why?” (personal communication, March 25, 2010). However, this thought process is a bit like the circular metaphor of the chicken and the egg. If journalists fail to create interactive graphics, there can be no payoff; this storytelling technique won't gain traction and “digital natives” and other potential users will seek content elsewhere.

Although there is considerable scholarship defining digital storytelling in terms of its unique features (Paul & Fiebich, 2005) and on interactive features of online newspapers (e.g. Chung, 2008; Greer & Mensing, 2006; Rosenberry, 2005; Schultz, 1999) there currently is little scholarship that provides both a theoretical and practical analysis of the process surrounding creation of interactive graphics. To date, most of the

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research surrounding interactive graphics on news sites comes in the form of content analyses that address how, when and how often they are used. While these are certainly valuable studies, they only scratch the surface of interactive graphics as storytelling devices. In-depth research requires a clear set of definitions that are universally used in the academy, industry and classroom. With a solid framework in place, researchers can more effectively explore interactive graphics typology, user experience, levels of effectiveness and best practices in development, to name a few. This paper will help fill that void by providing a framework for researchers studying the effectiveness of interactive graphics and their potential in storytelling. In addition, this framework will assist working journalists who strive to refine their nonlinear storytelling techniques.

The interactive Graphics Development (IGD) framework outlined in this paper was created after a careful examination of the work of news organizations that have committed time and resources to interactive graphics, such as *The New York Times*, the South Florida *Sun-Sentinel*, the *Detroit News*, the *Los Angeles Times*, *USA Today* and *MSNBC.com*. The framework is composed of two phases: Story Evaluation and Story Form Selection. The Story Evaluation phase is divided into points of analysis that center on the following three areas: news values, objectives and audience. At each point editors must apply journalistic standards and practices to determine if a story is worthy of placement on the budget and worthy of the time needed to complete an interactive graphic. The Story Form Selection phase defines five types of interactive presentations— instructives, narratives, data visualizations, simulations, and serious games—and provides evaluative measures to determine how and when they are best used.

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Phase One: Story Evaluation

Story evaluation: News values

Academics from diverse fields have long studied news values and have produced seminal work, especially in terms of gatekeeping (White, 1950; Gans, 1979) and agenda setting (Tuchman, 1978). Other scholars (Galtung & Ruge, 1965; Bell, 1991) and journalism textbook authors (Brooks, Kennedy, Moen, & Ranly, 2007) have developed lists of characteristics that provide a method for studying how news is evaluated.

Although there is considerable debate in academic literature over how news is selected, no single taxonomy has emerged to guide journalists or researchers who strive to understand the process, perhaps because it is difficult to analyze human behavior and because real-world events have many variables and can be complex. Braun (2009) notes that lists of news characteristics that appear in academic literature often “tell us more about the people studying and critiquing journalism than about journalists themselves: researcher-typifications, not actor-typifications. Such typifications run a high risk of proving specious when applied to journalists themselves” (p. 23).

Nonetheless, when editors learn of a story, they must evaluate it and establish its newsworthiness. They often use traditional elements that include conflict, significance, prominence, proximity, timeliness and novelty (Brooks, Kennedy, Moen, & Ranly, 2007). Conflict in news stories may center on overt actions such as a battle or war, crimes and human struggles against nature (e.g. earthquakes and tornadoes). Conflict also may be present in a clash of ideas or a psychological struggle such as depression. Significance – or threshold as defined by Galtung & Ruge (1965) – refers to whether a story has impact on the lives of the audience. A cure for cancer or record-high gasoline prices each

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would have great significance. Significance generally increases in direct proportion to the number of people a particular story affects. Prominence is defined as stories about well-known people, places or things, e.g. President Obama, Paris, or an iPod. Editors value news that has proximity because they can target the geographic location of their audience. A school board decision that affects students in the city in which the news organization publishes is of more interest than a school board decision on the other side of the state. Journalists often define news as what is happening “now” or in the “immediate future.” Conversely, if it happens in the past, it’s history. That philosophy gives import to the concept of timeliness. Novelty – or unexpectedness as defined by Galtung & Ruge (1965) – is associated with events or developments that are out of the ordinary or unusual, e.g. the cliché of dog bites man is not news, while a man who bites a dog is news. Some scholars also combine novelty with human interest, those stories that tug at the heartstrings.

Just as one can identify these news characteristics in text-based stories, the characteristics also are and should be present in interactive graphics, e.g. an interactive timeline that outlines the life and contributions of a prominent politician who has died (**prominence**); a photo-driven exploration that allows users to examine the ocean’s strangest creatures (**human interest**) or an interactive map that displays the number and location of homicides in a city (**conflict**).

An interactive “game” may allow voters to analyze the stance of candidates for president (**significance**) and an animation can follow the flight path of an airplane forced to make an emergency landing (**timeliness**). A data visualization can display information depicting the location of vacant homes in an area and the reasons why they exist

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(proximity). All these examples contain different levels of interactivity and complexity, which will be addressed in part two of the IGD framework.

However, **significance** has particular importance when evaluating news for interactive storytelling – especially projects with higher levels of interactivity. Significance, by definition, suggests that a large number of people may be affected by a story. In terms of time management, the greater the impact, the more justification for the minutes or hours needed to produce the interactive elements. Economically, more interest equals increased page views and potentially more time spent on a news organization’s Web site, both of which can translate into increased revenue from advertisers.

As noted earlier, timeliness (as in what is happening “now” or in the “future”) is an important element of how news is defined. When considering the potential for interactive graphics, however, editors also need to look at stories with longer life spans **(longevity)**. In other words, more effort and time should be spent on interactive elements that will exist for more than one news cycle. For example, stories on elections, complicated court trials and health epidemics have the potential to remain on a site for days, months or even years – and that means the interactive graphic may reach a larger audience. It also is likely that fresh material could be added continually to the core graphic, increasing efficiency. Longevity also can be applied to interactive elements defined as “evergreen,” e.g. a mortgage calculator that could be associated with various stories about the economy or home buying.

In summary, the IGD framework suggests that editors judging the interactive potential of a story should first consider and rate the traditional news characteristics of significance, prominence, proximity, conflict, novelty/human interest and timeliness and

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select stories that rate highly in these areas (see Table 1). Because of the time needed to produce most interactive graphics, increased importance should be placed on stories with **significance**. Additional consideration also should be given to interactive graphics that could potentially have **longevity**.

Story evaluation: Objectives

Before beginning a project, interactive news designers must have clearly defined objectives both for themselves and the project. Journalistic goals are closely tied to how journalists see their professional roles. There is no dearth of academic scholarship on the role of the press; however, technological and economic changes have forced scholars to rethink the important work of those such as Siebert, Peterson and Schramm (1956), whose *Four Theories of the Press* (authoritarian, libertarian, social responsibility and Soviet Communist) long dominated scholarly literature in journalism. Recent significant work includes that of Christians, Glasser, McQuail, Nordenstreng, & White (2009) who developed three levels of analysis – normative traditions, models of democracy and roles (monitorial, facilitative, collaborative, radical) of media (p. 16). In the monitorial (surveillance) role, journalists find and publish objective and reliable news accounts, act as a conduit for news and information and set the agenda. The facilitative role allows journalists to support community formation and citizen participation with government, while the collaborative role requires media cooperation with external agencies to meet the wider needs of society. The radical role allows journalists to act as adversaries in relation to authority or to advocate for a minority group (Christians et al, 2009). McNair (2005) describes journalism roles as 1) a “supplier of information,” 2) a “resource for, support to

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and often participant in public life and political debate,” and 3) a “medium of education, enlightenment and entertainment” (p. 28). The journalistic role also is related to the philosophy of the news organization through which the interactive will be viewed. Some legacy media Web sites might prefer approaches that are rooted in traditional definitions of objectivity, while editors at upstart online-only publications or blogs might not hesitate to produce elaborate interactive stories that align with their own political views and have a persuasive intent. Editors also could choose to place an interactive graphic with a point-of-view on an opinion page. There is no right or wrong approach; however, role identification is necessary when evaluating whether resources should be devoted to producing interactive content. One question to ask is: What is the journalistic role/objective for our news organization and can it be achieved by creating interactive content for this story?

The objective for a distinct interactive product should be more specific and should be user-driven. Journalists can learn from video games – another highly interactive storytelling form. Game designers are trained to clearly state the objective of the game before the game is fully developed and to draw a distinction between objective and outcome. For example, Fullerton, Swain, & Hoffman (2004) note that when someone reads a book, generally there is not a clear-cut objective for the experience; readers set their own objectives. In the child’s card game, Go Fish, they note, the player’s **objective** is to collect sets of cards by taking them from other players. Any number of players may successfully create sets as the game progresses, but the **outcome** is determined by who creates the most sets. When applied to the creation of interactive graphics, the **objective** may be to plot the number of homicides in any given area, but the **outcome** will be rooted

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in what the user takes away from the story and is able to apply to his or her life in a meaningful way.

Games are powerful education tools that have been underutilized by journalists even though the discussion of educational potential for games spans more than 30 years. Motivated by a desire to make learning fun, many educators and game developers have found success by applying game narrative strategies to subjects such as math, science and history, to name a few. And several studies have shown that simulation brought about by games accelerates learning (de Freitas, 2006), enables knowledge transfer (Banerjee & Stone, 2007), and provides experiential opportunities not available in the traditional classroom setting (Jackson, 2008). Thus “simulation and game environments focus learning not simply on the knowing of facts, but on the **using** of facts and ideas” (Jackson, 2008).

This concept is beginning to grow roots in journalism and multimedia. In their film, “Playing the News,” Plunkett and Mehta (2006) profile Kuma War, the first video game company to translate real-world stories of war into a video game experience. The game is based on the November 2004 U.S.-led attack on the Iraqi “terrorist stronghold” of Fallujah. The documentary explores whether video games have a place in serious journalism and whether they “represent the future of journalism or the dangerous blurring of news and entertainment.” Likewise, in 2007 Paul and Hansen launched the Knight News Challenge project “Playing the News” (unrelated to the film project previously discussed), a project intended to “create a toolset that would make the creation of a news simulation environment/game space easy for a somewhat motivated newsroom.”

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In summary, editors determining whether an interactive graphic is needed should be able to relate the journalistic goal of their organization to the specific objective and outcome for the interactive graphic. Furthermore, journalists should draw from game design theory and educational models to produce effective interactive content.

Story evaluation: Audience

Many journalists are trained to “know” their audiences. At the macro level, this means that they know their communities’ demographics and have a clear idea of who is consuming their news product. This data generally is available through research (company, trade, consultant), census data and/or focus groups. This mantra likely takes on increased importance in the creation of interactive graphics. Jones (2009) studied three online video and interactive storytelling strategies and concluded that preferences, not surprisingly, may be tied to the age of the audience. The study, although based on a small sample size, found that users between the ages of 18 and 24 preferred a nonlinear format and navigated through the story in unpredictable ways. Those over the age of 55 navigated in a traditional manner (starting in the upper right corner of the page and moving steadily downward) even when they explored content offered in a nonlinear format.

With this information in mind, editors should also consider their audience at the micro (story level). If a story has appeal only to an older audience, it might not be time efficient or effective to create interactive graphics with unconventional or complicated nonlinear elements. Conversely, a story that appeals to the “digital natives” might merit a game-like approach that integrates elements from many sources (including social media)

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and encourages a nonlinear, personal exploration of a topic or story. Age obviously is not the only audience factor that could affect the decision making process, but it does illustrate the importance of knowing your core audience (macro) as well as the appeal of a given story (micro).

The Story Evaluation Phase (news characteristics, objectives, audience) of the IGD framework is illustrated in Table 1, followed by a list of questions/prompts designed to help editors with the process.

Table 1
IGD Framework, Story Evaluation

News Characteristics	<i>Rate 1-5</i>	Objective/Outcome	Audience
Significance		Journalistic	Macro
Conflict			
Proximity		Project	Micro
Timeliness			
Prominence			
Novelty		User	
Longevity			

- Does the story contain the appropriate news characteristics to merit selection and development?
- How will these news characteristics be presented in an interactive graphic?
- Does the story have a high level of significance and/or longevity?
- Does the story further the journalistic role of the news organization?
- Does the interactive have a clearly defined audience-centered objective and outcome?
- What will the users learn from this interactive?
- What need is satisfied by this interactive graphic?
- Can the audience for the interactive be described on a macro and micro level?

After the story has been evaluated using the first phase of this framework, it becomes necessary to select the interactive story form that best serves the topic and

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audience. Thus, the Story Form Selection Phase defines various interactive presentations and helps determine how and when they are best used.

Phase Two: Story Form Selection

In a 2007 article in *Design* magazine, Don Wittekind noted that small newspapers significantly lag behind larger newspapers in the sophistication and prevalence of multimedia and interactive content. Likewise, that same year, the Pew Project for Excellence in Journalism reported that only six of the 38 news sites it analyzed for multimedia content offered a rich range of media formats. And on nearly half of the sites (17) more than 75% of the content was in the form of narrative text. According to Wittekind, a former South Florida *Sun-Sentinel* graphics director and multimedia graphics pioneer, “as news organizations strive to produce ever more multimedia while expending increasingly less effort, the immersive interactive graphic has become somewhat of an endangered species” (p. 39). But Wittekind also argues that although interactive multimedia graphics can be time consuming to create and require specialized software skills on the part of their producers, they are the types of content most capable of taking full advantage of the Web’s strengths as an interactive medium. More recent studies have shown that not much has changed since Wittekind’s assessment. A few newspaper Web sites, such as nytimes.com, sun-sentinel.com, and washingtonpost.com have been prolific producers of interactive graphics and data visualizations and have experimented with combining game strategies with journalistic storytelling (Paul & Hansen, 2008), but the adoption of interactive news elements on most newspaper and television station Web sites is still marginal (Pew Project for Excellence in Journalism,

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2009).

Wittekind asserts that video and linear animations “can be handled by other media, and none of them take full advantage of all the Internet has to offer. But the interactive graphic – and the key word here is ‘interactive’ – is something that is unique to the Web” (p. 39). If this is true, then many news Web site editors clearly are missing out on a very powerful storytelling form. Yet if we are truly to understand what we’re missing, we must first attempt to narrowly define different types of interactive graphics. It’s important to note that as a graphic migrates to the Web, the potential for animation and interactivity fundamentally change the structure and navigation. Maps, charts and diagrams are still the basic starting points for online graphics. However, Web graphics go a step further by providing a more immersive user experience. Online graphics can be presented in a nonlinear fashion. They can simulate real world experiences and employ game strategies. And they can implement sound and animation to enrich understanding and better reflect reality.

For the purposes of this exposition, interactive graphics are divided into five main categories: **instructives, narratives, simulations, serious games and data visualizations**. The first three categories—instructives, narratives and simulations—were first conceptualized by Rajamanickam and Nichani (2003), and the second two categories—serious games and data visualizations— were added because of the recent evolution of journalistic interactives. These definitions are important because they provide a concrete framework for journalists who wish to produce them and scholars who wish to study them. The definitions also offer journalists a common vocabulary that can be regularly used in the newsroom to identify methods of storytelling. After all, being

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able to clearly communicate the goals for a story package is often half the battle. For scholars, the definitions provide a clearer typology on which to base future studies that address user behavior, storytelling techniques and journalistic practice.

Instructives explain how something happens or how something works by enabling the user to sequentially step through the visual and textual content of the graphic. Instructives are good for showing processes, such as how a tornado forms or how to get your home ready to sell. They are immersive because they allow users to click through at their own pace, however the sequence of events is generally predetermined. Instructive graphics often are divided into discreet “scenes” and the user can click a “next” or “back” button to navigate from scene to scene. Instructive graphics generally are the least time-consuming to create because interactivity and animation are relatively simple. In fact, with very basic HTML or Adobe Flash skills, a journalist could quickly turn a simple diagram initially created for print into an instructive graphic for the Web.

Narratives are much like video in that they allow the viewer to watch an animated explanation of a process or event. Narratives combine audio voice-over with graphic depth and rich animation. For example, in 2005, msnbc.com created a narrative graphic to explain the rise and fall of Enron. At first, assessing the graphics potential for such a story might seem daunting. However, in this case, the narrative graphic format provided msnbc.com with a unique and simple way to explain an extremely complex chronology. Because narratives involve very little interactivity, it is important that the animation be dynamic and relatively constant. If too much time passes with little or no animation, the user is likely to lose interest in the graphic. Thus, when journalists are deciding whether a topic would make a good narrative graphic, they should consider

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whether the illustrative portions of the graphic have enough animation potential. Good narrative topics include how a space shuttle launches or describe the phases of the moon because they have great potential for animation and can be explained succinctly and simply. Depending on the level of animation, narratives can be more time-consuming than instructives. More knowledge of how to execute animations using a program such as Adobe Flash is necessary.

Simulations represent real-world phenomena. Highly immersive simulations allow the user to experience an activity that resembles its real world equivalent. In 2001, for example, the South Florida *Sun-Sentinel* created a simulation graphic called “Hurricane Maker” that helped users understand the conditions present during a hurricane. By allowing the user to choose the location of a storm over a body of water and then change wind conditions and humidity levels, the creators were able to illustrate hurricanes from a much more tangible perspective. It is important to note that only topics that are effectively reenacted using a computer interface are suitable for simulations. When you encounter experiences that are difficult to replicate on a computer, an instructive graphic may be more appropriate. The complexity of a simulation depends on how much programming is necessary for it to function. Engaging simulations can be achieved using many different application types, including Adobe Flash, JavaScript and HTML.

Serious games are like simulations in that they offer a highly immersive, interactive experience. However, they go a step further by actually applying traditional gaming strategies to serious storytelling. The idea is that the more you can immerse a user in the graphic, the more he or she will learn and stay engaged. Serious games are

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very complex because they must be both journalistically accurate and appropriately serious in tone, illustration and content, and at the same time be fun, engaging and worth playing. Likewise, they must effectively employ game strategies, such as having a storyline that pulls the user through the game. They must also make room for winning and losing or offer some “payoff” in the end. Serious games must explain the rules of play, as well as employ tasks that are reasonably achieved using a computer interface. Perhaps one of the most well known serious games is titled “Darfur is Dying.” Intended to provide a window into the experience of Darfurian refugees in the Sudan, “Darfur is Dying” is a viral video game in which players take on the persona of a refugee and must perform daily life tasks while constantly threatened by militia attackers. Players can also access information about the Darfur genocide responsible for more than 400,000 deaths, as well as ways to get involved with humanitarian efforts in the region. Serious games are commonly combined with other multimedia story packages as a means for journalistic reporting outside the actual game. For example, a graphics package about a day in the life of an American soldier combines simple games that allow the user to complete daily tasks, such as assembling a rifle or searching for IEDs with updated news stories and other content about ongoing wars in the Middle East. Games are often the most time-consuming types of interactive graphics because levels of interactivity, animation and programming are often high.

Data visualizations combine databases with interactive maps, charts and diagrams to help users visualize complex information. Although they are based on hard numbers, data visualizations can be the most beautiful, creative interactive graphics. Data visualizations can come in the form of maps such as *The New York Times*’ periodically

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updated “Geography of a Recession” or innovative charts like *The Washington Post’s* “POTUS Tracker” an interactive database that provides a visualization of how President Obama spends his time, what issues are getting the most attention and who is influencing the debate. They can even be graphically enhanced searchable databases like the *Sun-Sentinel’s* mall crimes database. And even more important than the visual display of data is the ability to understand and effectively synthesize it. In the case of the mall crimes database, *Sun-Sentinel* compiled data based on the examination of more than 22,000 police reports. They found that more than 500 cases were violent crimes and cataloged the details in a spreadsheet. That data was then handed off to a graphics reporter and multimedia director to design and develop the Flash-based database and accompanying information graphics. Often, the amount of time it takes to create a rich data visualization depends on how much data analysis must be done. This has less to do with the production of the graphic itself and more to do with the amount of research and reporting that are required. Data visualizations can be created using Adobe Flash and HTML, as well as ArcView, a GIS data program.

In summary, clearly defined content types are needed before scholars can study the effectiveness of interactive graphics in storytelling and before their use can become widespread among all news organizations. Only after these definitions are in place can we attempt to determine how interactive graphics are best used and develop strategies for implementation. Although all interactive graphics begin with planning and conceptualizing the visual narrative, creating all of the illustrations and graphic elements, researching and writing explanatory text, and the typical editing processes, there are a few additional considerations that make interactive graphics a bit more challenging.

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Specifically, in addition to understanding the key characteristics of each type (as outlined above), journalists must be able to quickly assess the time commitment associated with each, as well as how and when they are best used. Therefore, Table 2 provides a guide for navigating those key considerations.

Table 2: IGD Framework, Story Form Selection

	INSTRUCTIVE	NARRATIVE	SIMULATION	DATA VIS	SERIOUS GAME
Intention	To explain a process or how something occurs or works	To explain a process or how something occurs or works; to show how an event unfolds	To heighten understanding by allowing user to experience a process through the graphic	To help user visualize complex data or statistical information.	To enhance understanding through experiential, immersive story structure
When to use	When a process or linear event needs visual explanation; when there's a question of HOW something happened; when a step-by-step process is explained	When a graphic has high animation potential; when a description requires narrative detail; when explaining a linear process or event; when topic is dynamic/active	When interaction makes sense in the digital space; when simulating an experience helps the user better understand a story or concept.	When a story is complemented by a large, often complex, data set	When game strategies enhance storytelling or offer compelling reason to engage; when "serious play" helps users learn about a subject that affects their lives
Navigation	Mostly linear; generally navigated in steps (i.e., each frame represents a step in a process)	Linear; user generally begins with a "start" button and animation plays through automatically	Either linear or nonlinear, depending on the topic	Generally nonlinear; user controls which data are visible at once and can view discrete combinations of data at one time	Often linear in parts (navigation through the game environment) and nonlinear in other (segments that allow the user to make choices)
Level of User Interaction	Low to moderate; aside from navigational interaction, there is little interaction on the part of the user	Low; generally passive viewing experience of animated illustration	Moderate to high, depending on the topic; some simulations can randomly respond to user input; some have predetermined outcomes based on user input	Moderate to high, depending on the topic; interactivity often involves clicking to change visualization of data in chart or map form	High; interactive features allow user to experience a scenario; interactivity is used to engage in significant game play
Potential for Animation	Low to moderate; animations are often simple and segmented	High; animation driven; explanation is in the form of audio narrative that is timed to correspond with the animation	Moderate to high, depending on the topic	Light to moderate, depending on the data set and chosen presentation style	High; animation is often heavy in all aspects of the presentation, including general navigation (i.e., moving through the game)
Time Commitment	Low to moderate, depending on	Moderate to high; static images with audio are boring	Moderate to high; heightened levels of interactivity	Moderate to advanced, depending on	High; heightened levels of interactivity,

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	amount of animation; ranges from no animation to light to moderate animation	and can cause readers to quickly disengage if too much time passes with no animation; complex animation and audio development can be time consuming	and a more involved planning state make sims more time consuming; planning stage can be time consuming; higher levels of interactivity make programming more complex	the complexity of data; can quickly become time consuming if data set is very complex or large and if a database is necessary	complex programming and advanced levels of animation
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Discussion

There is no denying the major shift in audience expectations for news content brought about by the coming of age of the digital native generation. Audiences are increasingly drawn to content that is interactive, dynamic, immersive and nonlinear. As news organizations seek ways to better respond to these audience trends, it may become necessary not only to rethink the ways in which stories are structured, but to rethink how we define the foundational news values used to assess a story’s interactive potential. Thus, the two-part IGD framework offered here is intended as a call to action for news organizations to do just that.

Admittedly, news organizations are increasingly limited in resources, and small news organizations are especially challenged to find staff with the necessary skill sets and time to execute the types of interactives outlined in this paper. However, an adjustment in how we currently think about the assessment and development of interactive stories and an investment in the necessary resources for doing so will surely pay dividends in the future. During the late-1980s and early 1990s, newspapers experienced a similar revolution when page design, graphics reporting and information layering took center stage as ways to better serve the increasingly visually-savvy audiences of scanners and samplers. By bringing page design into the newsroom and hiring individuals trained as

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both journalists and graphic artists, newspapers were able to better serve audiences and meet the needs of a changing readership. This is no different than when other major technological advances altered the ways news was delivered and consumed. For example, newspapers were affected by the advent of radio. Radio was changed by the introduction of television. And the Internet has turned everything upside down. Thus, rather than trying to shoehorn traditional newspaper delivery into the online platform, journalists and educators alike should embrace the rich, interactive potential of the Web by putting resources toward the types of interactive graphics outlined in this paper.

Although many editors have been quick to dismiss interactive graphics as too time consuming and lacking in payoff, no studies exist that have actually quantified this assertion. One reason could be that few online news sites actually publish interactives regularly enough to study them. And as Goldman noted, because many interactives are developed in Adobe Flash, standard Web metrics don't always offer an accurate picture of the number of "hits" or time spent with interactives by users.

Future research based on the IGD framework would benefit practitioners who are struggling to develop best practices for interactive storytelling. Researchers, educators and journalists also could use this model to examine which interactives are most attractive to users, expand on studies that address user recall of information in graphic storytelling, and determine whether interactives are more appealing to users than traditional story forms. Ideally, the results would help news managers support interactive storytelling that benefits the bottom line and enhances the journalistic mission. Likewise, due to the relative newness of multimedia storytelling and interactive graphics in journalism, there exists a need for research into the actual effectiveness of different

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storytelling forms for different audiences and purposes. This will prove to be a relatively complex endeavor because there are so many variables involved. The presence of animation, interactivity, nonlinear formats, visual/verbal and audio/visual combinations—to name a few—make establishing sound methodology for evaluating effectiveness a formidable challenge. However, with a framework for defining different types of interactive graphics in place, we are hopefully one step closer to being able to determine whether the ability to visualize and manipulate large datasets helps or hinders users' ability to understand large quantities of complex data. Likewise, future studies should explore the role of animation, nonlinear presentation, and heightened interactivity in graphics and whether these features advance storytelling or overwhelm the senses. Ultimately, future research must build on the IGD framework, which establishes the pragmatics for choosing a graphic story form with an understanding of its effectiveness among users.

The storytelling methods outlined here run the gamut when it comes to the time and resources required for their effective creation and implementation. However, forming a clear understanding of the types of interactive packages that are available is essential to understanding how to better harness the interactive multimedia potential of the Web. Likewise, if multimedia journalists have a clearer picture of how these types of interactives are best applied to individual stories, the question of whether they are “worth it” becomes easier to negotiate. Although many newsrooms have embraced the use of video and photo slideshows as worthwhile multimedia endeavors, interactive information graphics are largely absent on most news sites. Of course, this assessment should in no way be considered an indictment against photo and video as powerful storytelling tools.

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However, if Wittekind (2007) is correct in his assertion that interactive graphics are the only story forms that take full advantage of all the Internet has to offer, then many news organizations clearly are missing out on a very powerful storytelling form.

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