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Subj: CHINFO MEDIA AND COMMUNICATION STUDY GUIDE

Encl: (1) The DICE Process
(2) Creating Personas
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1. Purpose. The CHINFO Media and Communication Study guide is a collection of new training material for Navy media and communication professionals.

2. Background. This guide is a transition document designed to fill identified training and knowledge gaps until an updated Media and Communication Non-Resident Training Course is complete. It is the collective responsibility of leadership, supervisors and individuals to place an emphasis on training for their people and themselves. This training guide provides new professional and personal development training that can enable every individual to excel in his or her duties.

3. Information covered in this guide has been reviewed to ensure it aligns with NOS B610 Occupational Standards, tasks and requirements, and support the B610 training Career Continuum.


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<https://www.chinfo.navy.mil/chinfo/ChinfoInstructions.aspx>

The DICE process

DICE is a four-step communication process that combines design-thinking with communication and user-design principles to better apply creative and critical thinking to the communication process.

The Four Steps of DICE

1. Define the problem.
2. Ideate possible solutions. Design plans.
3. Create content and/or experiences.
4. Evaluate effects.

DICE can be applied to every communication challenge, big or small. The intent is to apply design thinking and user-design principles to communication opportunities to focus on achieving a desired end state.

Define the Problem

The first step of the DICE process is to define the problem. This is accomplished through understanding the assigned mission/task, the commander's intent, the desired end state and defining the problem with a concise problem statement.

Understanding the Mission/Task

Using the framework of the Military Decision-Making Process (MDMP), communicators need to understand their commander's stated mission and specified and implied tasks for the operation, mission or evolution.

The stated mission is what the commander expects to be accomplished. For media and communication professionals, the following are routine stated missions:

1. Inform the crew about the new <add name> policy
2. Pass the upcoming 3M assessments
3. Train the crew to increase ship survivability

Specified tasks. Specified tasks are those specifically assigned by either the commander or higher authority. For media and communication professionals, the following are examples of specified tasks:

1. Write news story
2. Publish daily at-sea newspaper
3. Create video

Implied tasks. Implied tasks are those that must be performed to accomplish a specified task, but are not stated. Implied tasks are derived from an analysis of the mission and specified tasks. Examples of implied tasks for the “Write news story” specified task are:

1. Schedule interview
2. Conduct interview
3. Copy edit story
4. Attain release approval for story

Essential tasks. After analyzing specified and implied tasks, essential tasks are ones *must* be executed to accomplish the mission.

Commander’s Intent

The commander’s intent is a clear, concise statement of what must be done to achieve the desired end state. It provides the link between the mission and the concept of operations by stating the key tasks that, along with the mission, are the basis for subordinates to exercise initiative when unanticipated opportunities arise or when the original concept of operations no longer applies.

If the commander wishes to explain a broader purpose beyond that of the mission statement, he may do so. Intent is normally expressed in four or five sentences and is mandatory for all orders. The mission and the commander’ intent must be understood two echelons down.

Understand what people need

Begin all projects by exploring and pinpointing the needs of the people who will use the service or product and the ways it will fit into their lives. Whether the users are members of the public or part of the Navy family, we must include real people in the design process from the beginning.

The needs of people — not constraints of government structures or silos — should inform technical and design decisions. We need to continually test the products we build with real people to keep us honest about what is important.

Checklist

- Early in the project, spend time with current and prospective users of the service
- Use a range of qualitative and quantitative research methods to determine people’s goals, needs, and behaviors; be thoughtful about the time spent
- Test prototypes of solutions with real people, in the field if possible
- Document the findings about user goals, needs, behaviors, and preferences
- Share findings with the team and agency leadership
- Create a prioritized list of tasks the user is trying to accomplish, also known as “user stories”
- As the digital service is being built, regularly test it with potential users to ensure it meets people’s needs

Key Questions

- Who are your primary users?
- What user needs will this service address?
- Why does the user want or need this service?

- Which people will have the most difficulty with the service?
- Which research methods were used?
- What were the key findings?
- How were the findings documented? Where can future team members access the documentation?
- How often are you testing with real people?

Define the audiences

- Define the target audiences
- Develop personas

(source: <https://playbook.cio.gov/#play1>)

Define the Problem

After gaining an understanding of the unit's current mission/task and the tasks required to achieve it, the next step is to define the problem.

Introduce the problem

This step is a pre-step brainstorming step where the team members state their perceptions of the problem and list the general goals of the group.

Define and analyze the problem

- Problem recognition (clarify the problem and provide evidence)
- Is there a core issue/problem?
- Separate problem from problem indicators
- Seek to understand root causes or potential root problems
- Developing a problem statement
- Exploration of the problem (break it down into smaller, manageable parts)
- Define the assumptions
- Replace assumptions with facts through research
- Consider what specific elements the solution to the problem must achieve or include
- Define the constraints

Write the Problem Statement and Criteria

- Write the problem statement
- Write the criteria the group agrees to follow in reaching a solution
 - Criteria are guidelines to follow
 - They establish standards and goals that have to be in place for an acceptable decision

Ideate Solutions and develop the plan

DICE can be applied to every communication challenge, big or small. The intent is to follow the process to gain a better understanding of the issue or problem to force the team or individual to think from different points of views.

Ideating Solutions is about brainstorming as many different solutions to the problem or issue without applying any constraints.

In the ideation phase, teams brainstorm ALL possible solutions. No solution should be evaluated or dismissed during brainstorming.

According to Thomas Kelley and Jonathan Littman in *“The Art of Innovation: Lessons in Creativity from IDEO, America’s Leading Design Firm,”* there are seven secrets to conduct better brainstorming sessions:

1. **Sharpen the Focus.** Start with a statement of the problem or a specific question.
2. **Playful Rules.** Don’t critique or debate ideas. At IDEO, the company sometimes posts rules like, “Go for Quantity,” “Encourage Wild Ideas,” or “Be Visual.”
3. **Number Your Ideas.**
4. **Build and Jump.** Build on a brainstorming idea for a while and then as momentum slows, jump to another idea or idea chain.
5. **The Space Remembers.** Write the flow of ideas down in a visible medium so the entire group can see.
6. **Stretch Your Mental Muscles.** Group warm-up exercises can help clear the mind and set the right tone for the brainstorming session. Warm-ups can be almost anything from word games the group plays in the beginning of the session to discussions about pre-assigned homework.
7. **Get Physical.** Brainstorming sessions are supposed to be visual. Sketches, mind maps, diagrams, flow charts and stick figures should all be used to help communicate ideas.

Selecting Ideas to develop into plans

After brainstorming, the team must then identify which ideas should be turned into a plan and executed.

Use SMART Objectives to move brainstorming ideas into action. SMART Objectives are:

- **Specific:** Concrete, detailed, and well defined so that you know where you are going and what to expect when you arrive
- **Measurable:** Numbers and quantities provide means of measurement and comparison
- **Achievable:** feasible and easy to put into action
- **Realistic:** Considers constraints such as resources, personnel, cost, and time frame
- **Time-Bound:** A time frame helps to set boundaries around the objective

Create Content and Experiences

The third step of the DICE process is to create the content and/or experience. Content is created using User Experience principles.

User Experience Basics

User experience (UX) focuses on having a deep understanding of users, what they need, what they value, their abilities, and also their limitations. It also takes into account the business goals and objectives of the group managing the project. UX best practices promote improving the quality of the user's interaction with and perceptions of your product and any related services.

Factors that Influence UX

At the core of UX is ensuring that users find value in what you are providing to them. Peter Morville represents this through his [User Experience Honeycomb](#).

He notes that in order for there to be a meaningful and valuable user experience, information must be:

- **Useful:** Your content should be original and fulfill a need
- **Usable:** Site must be easy to use
- **Desirable:** Image, identity, brand, and other design elements are used to evoke emotion and appreciation
- **Findable:** Content needs to be navigable and locatable onsite and offsite
- **Accessible:** Content needs to be accessible to people with disabilities
- **Credible:** Users must trust and believe what you tell them



Best Practices for Creating Meaningful Content

To create meaningful and relevant content, each piece of should:

- Reflect your organization's goals and user's needs. You can discover your user's needs through conducting market research, user research, and analyzing web metrics.
- Understand how user's think and speak about a subject. Content should then be created and structured based on that. Doing this will also help you with search engine optimization (SEO).
- Communicate to people in a way that they understand. Embracing plain writing principles helps with this.
- Be useful. By being purposeful in the content that you include, omit the needless.

- Stay up-to-date and remain factual. When new information becomes available, update your content or archive it.
- Be accessible to all people. You have a responsibility to make sure that all people can access and benefit from your information.
- Be consistent. Following style guides, both for language and design, helps people understand and learn what you are trying to communicate.
- Be able to be found. Make sure that users can find your content both through internally through navigation and also externally through search engines.
- Help define the requirements for the overall site. Content should drive design, structure, etc.

Sources:

<https://www.usability.gov/what-and-why/content-strategy.html>

<https://www.usability.gov/what-and-why/user-experience.html>

Evaluate Effects

The fourth step of the DICE process is to evaluate effects. You should conduct evaluation that is relevant and meaningful for what you are trying to achieve and the methods used.

There are four main evaluation types we are interested in collecting. Not all campaigns, content or experience productions require using the four evaluation types. Use the evaluation type most aligned with your communication plan and objective.

The four evaluation types are: Formative evaluations, Process evaluations, Outcome evaluations and Impact evaluations. Evaluating Impact is the most difficult type to collect, but it is also the most important evaluation type.

Evaluation Type	Purpose	Sample Questions
<i>Formative</i>	Assesses the strengths and weaknesses of campaign materials and strategies, and their (likely) translation into practice before or during campaign implementation.	How does the campaign's target audience think about the issue? What messages work with what audiences? Who are the best messengers? What outcomes are being achieved?
<i>Process</i> (summative)	Examines campaign implementation, measuring effort and the direct outputs - what and how much was accomplished.	How many materials have been put out? What has been the campaign's reach? How many people have been reached?
<i>Outcome</i> (summative)	Measures effects and changes that result from the campaign. Assesses outcomes in the target audiences that come about as a result of campaign strategies and activities.	Has there been any affective change (beliefs, attitudes, social norms)? Has there been any behavior-change? Have any policies changed?
<i>Outcome</i> (customer)	Measures the satisfaction of the campaign customer.	Did the campaign meet your expectations? Was the campaign content or experiences professionally produced?
<i>Impact</i> (summative)	Measures community-level change or longer-term results achieved as a result of the campaign's aggregate effects on individuals' behavior and the sustainability of the behavior. Attempts to determine whether the campaign caused the effects.	Has the behavior-change resulted in its intended outcomes (e.g., lower cancer rates, less violence in schools) Has there been any systems-level change?

Personas

The purpose of personas is to create reliable and realistic representations of your key audience segments for reference. They can be used to help understand the audience currently using your information product or can be built to provide a composite of the audience you intend to target. Personas are only as good as the research behind them and should be based on qualitative and some quantitative user research.

Effective personas

- Represent a major user group for your digital presence
- Express and focus on the major needs and expectations of the most important user groups
- Give a clear picture of the user's expectations and how they're likely to use the site
- Aid in uncovering universal features and functionality
- Describe real people with backgrounds, goals, and values

Benefits of Personas

Personas help to focus decisions surrounding site components by adding a layer of real-world consideration to the conversation. They also offer a quick and inexpensive way to test and prioritize those features throughout the development process.

In addition they can help:

- Stakeholders and leaders evaluate new site feature ideas
- Information architects develop informed wireframes, interface behaviors, and labeling
- Designers create the overall look and feel of the website
- System engineers/developers decide which approaches to take based on user behaviors
- Copy writers ensure site content is written to the appropriate audiences

Persona Goals

Personas development belongs at the beginning of the project, as personas can inform site functionality, help uncover gaps, or highlight new opportunities. You may develop one or more personas for a project but limit yourself to the main audiences for the site.

For any given project, creating only three or four personas is best. Remember that it is better to paint with a broad brush and meet the needs of the larger populations than try to meet the needs of everyone.

The goal of personas is not represent all audiences or address all needs of the site, but instead to focus on the major needs of the most important user groups.

Developing Personas

To ensure your personas are accurate representations of your users and have the support of your stakeholders throughout the process, you should:

Conduct user research

Who are your users and why are they using the system?

- What behaviors, assumptions, and expectations color their view of the system?
- Who is your audience?

Who is your target/desired audience?

- What is their background?
- What experiences have they had?
- What are they looking to accomplish?
- What are some challenges they face?
- What are some potential ways to address those challenges?
- What Persona Group (i.e. web manager) do they belong to?

Define the purpose and vision

- What is the purpose of the content/site/experience?
- What are the goals of the content/site/experience?

Describe the User

- Personal
 - What is the age of your person?
 - What is the gender of your person?
 - What is the highest level of education this person has received?
 - Fictional name
- Professional
 - Job titles and major responsibilities
 - How much work experience does your person have?
 - What is your person's professional background?
 - Why will they come to the site? (User needs, interests, and goals)
 - Where (or from whom) else is this person getting information about your issue or similar programs or services?
 - When and where will users access the site? (User environment and context)
- Source of information/knowledge
 - Where does your person get information from?
 - What sources of information does your person trust the most?
 - How would your person be able to understand the information?
 - What technological devices does your person use on a regular basis?
 - What software and/or applications does your person use on a regular basis?
 - Through what technological device does your user primarily access the web for information?
 - How much time does your person spend browsing the web every day?

User Motivation

- What is your person motivated by?
- What are they looking for?
- What is your person looking to do?
- What are his needs?
- Write a quote that sums up what matters most to the persona as it relates to your content/site/experience

Condense the research

Look for themes/characteristics that are specific, relevant, and universal to the system and its users.

Brainstorm: Organize elements into persona groups that represent your target users. Name or classify each group.

Refine: Combine and prioritize the rough personas. Separate them into primary, secondary, and, if necessary, complementary categories. You should have roughly 3-5 personas and their identified characteristics.

Make them realistic: Develop the appropriate descriptions of each personas background, motivations, and expectations. Do not include a lot of personal information. Be relevant and serious; humor is not appropriate.

Organize persona information in an easy to read, logical format.

Simple persona

A simple persona contains basic information about a typical user to include their role, goals and needs.

Globalchange.gov

Scientist Steve

Works as: Gov Researcher

My themes: Evaluate,
Research, Advise, Analyze



His role

- Expert in climate change
- Engages deeply with USGCRP

Goals



- Advance his work through collaboration with other researchers
- Evaluate and provide feedback on the work of other scientists
- Identify gaps in existing climate research & explore new research topics
- Showcase & promote their contributions to federal climate research



Needs

- Searchable repositories of info & data (dashboards)
- Streamlined access to resources, data, and tools from other agencies
- Traceable references & citations, consistent across organizations
- Visibility into other areas of climate research that may be related to their work
- Instructions & tutorials on how to access & analyze federal climate data

Complex persona

A complex persona contains more detailed information about a specific category of user. It can include a composite background made of typical information from many similar users, their goals, frustrations and challenges, desired feature and information on how they use technology or access information.

HHS.gov
Project H Personas

Health Care Professional



Alicia

Age: 47
Occupation: Family and General Practice Doctor
Employer: Raleigh Center for Family Medicine
Education Level: Post-Graduate
Income: \$188,000

BACKGROUND

After 10 years working on staff at a local hospital, Alicia and two of her colleagues have decided to start their own practice. She heard about the government mandate for electronic records at a medical convention. She is under a tight deadline to find out more about the mandate to bring back to her partners so that they can make decisions about hardware and software needs.

I am excited about opening a new practice with my partners. We are starting small but looking forward to growing!

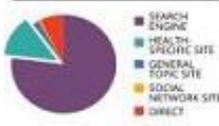
DEVICES



TECH SAVVY



SITE ACCESS



- SEARCH ENGINE
- HEALTH-SPECIFIC SITE
- GENERAL TOPIC SITE
- SOCIAL NETWORK SITE
- DIRECT

PRIMARY GOAL

Alicia is opening a small medical practice with two other doctors. Of the three partners, she is tasked with researching the government's mandate for electronic medical records by 2015. She wants to know if there are any incentives available to help her practice avoid penalties.

- Find information about certified Electronic Health Record products.

FRUSTRATIONS & CHALLENGES

- I found it difficult to navigate the information on the OCR website because I am not sure where to look.
- I found press releases and news articles about EHR but nothing about EHR products.
- It was difficult for me to understand which regulations and provisions apply to my practice.

REASON FOR VISITING HHS.GOV

- Find out the HPAIA laws and policies related to electronically transmitting medical records.
- Determine which provisions in the Affordable Care Act will affect her practice.
- Research Medicare and Medicaid Electronic Health Record (EHR) Incentive Programs.

FEATURES DESIRED

TASK-BASED NAVIGATION

AUDIENCE-BASED NAVIGATION

CONSISTENT LOOK & FEEL

MOBILE-FRIENDLY

EASY TO READ CONTENT

INTERACTIVE & MEDIA CONTENT

Easy to Read Content

Task-Based Navigation

Audience-Based Navigation

Interactive & Media Content

Mobile-Friendly

Consistent Look & Feel

Sources:

<https://www.usability.gov/how-to-and-tools/methods/personas.html>

<https://www.digitalgov.gov>

Writing for the web

When writing for the web, using plain language allows users to find what they need, understand what they have found, and then use it to meet their needs. It should also be actionable, findable, and shareable.

It's important to understand how what you are writing fits into the overall content strategy, what the content lifecycle entails, and who is involved in the process.

Why it matters

People read differently online than they do when they read print materials -- web users typically scan for information. In a [study of online reading behavior](#), Jakob Nielsen found that "on the average webpage, users have time to read at most 28% of the words during an average visit; 20% is more likely".

Identify Your Users' Top Tasks

People come to your website with a specific task in mind. When developing your site's content, keep your users' tasks in mind and write to ensure you are helping them accomplish those tasks. If your website doesn't help them complete that task, they'll leave. Conduct market research, perform a [task analysis](#) and other types of user research, and [analyze metrics](#) to better understand what users are looking to accomplish.

Knowing your users' top tasks can help you identify:

- Content to feature on your homepage or landing pages
- Page headers and sub headers
- A logical structure to each page's content

How to Write User-Friendly Content

It's important to target your audience when writing for the web. By knowing who you are writing for, you can write at a level that will be meaningful for them. Use the [personas](#) you created while designing the site to help you visualize who you are writing for.

- **Use the words your users use.** By using keywords that your users use, you will help them understand the copy and will help optimize it for search engines.
- **Chunk your content.** Chunking makes your content more scannable by breaking it into manageable sections.
- **Front-load the important information.** Start with the content that is most important to your audience, and then provide additional details.
- **Use pronouns.** The user is "you." The organization or government agency is "we." This creates cleaner sentence structure and more approachable content.
- **Use active voice.** "The board proposed the legislation" not "The regulation was proposed by the board."
- **Use short sentences and paragraphs.** The ideal standard is no more than 20 words per sentence, five sentences per paragraph. Use dashes instead of semi-colons or, better

yet, break the sentence into two. It is ok to start a sentence with “and,” “but,” or “or” if it makes things clear and brief.

- **Use bullets and numbered lists.** Don’t limit yourself to using this for long lists—one sentence and two bullets is easier to read than three sentences.
- **Use clear headlines and subheads.** Questions, especially those with pronouns, are particularly effective.
- **Use images, diagrams, or multimedia** to visually represent ideas in the content. Videos and images should reinforce the text on your page.
- **Use white space.** Using white space allows you to reduce noise by visually separate information.

It’s also important to create an editorial calendar. You can encourage visitors to return to your site by keeping your content fresh and up-to-date, especially when working with blogs, social media, or dynamic content websites.

SOURCE: <https://www.usability.gov/how-to-and-tools/methods/writing-for-the-web.html>

Document Checklist for Plain Language on the Web

On the web, people are in a hurry. They skim and scan, looking for quick answers to their questions. Help your readers quickly find what they need with these web writing tips:

- Less is more! Be concise.
- Break documents into separate topics.
- Use even shorter paragraphs than on paper.
- Use short lists and bullets to organize information.
- Use even more lists than on paper.
- Use even more headings with less under each heading.
- Questions often make great headings.
- Present each topic or point separately, and use descriptive section headings.
- Keep the information on each page to no more than two levels.
- Make liberal use of white space so pages are easy to scan.
- Write (especially page titles) using the same words your readers would use when doing a web search for the info.
- Don’ t assume your readers have knowledge of the subject or have read related pages on your site. Clearly explain things so each page can stand on its own.
- Never use "click here" as a link — link language should describe what your reader will get if they click the link.
- Eliminate unnecessary words.

SOURCE: <http://www.plainlanguage.gov/howto/quickreference/weblis.cfm>

Storytelling

Storytelling is one of the most important tools available to communicators to help them convey a message. People learn, remember and understand the best through story. Leo Widrich, co-founder of [Buffer](#), writes on his blog post “The Science of Storytelling” that evolution has wired the brain for storytelling. Storytelling is how we communicate what we value the most.

Story Arc

Story Arc refers to the shape a story takes as it moves from the beginning to the middle and then to the end. Also known as Aristotle’s Narrative Arc and as Freytag’s Pyramid, story arcs have, at a minimum, an inciting moment, rising action, a climax and a resolution. Story arcs may also have the following: exposition, complications, falling action, and a dénouement.

Elements of the Story Arc

The **exposition** portion of a story arc is where the scene is set, characters introduced and any needed background information is provided.

The inciting moment is a single event that signals the main complication and starts the rising action.

Rising action is the build-up of events that drive the story to the climax.

Complications are the challenges the subject faces as the story moves towards the climax.

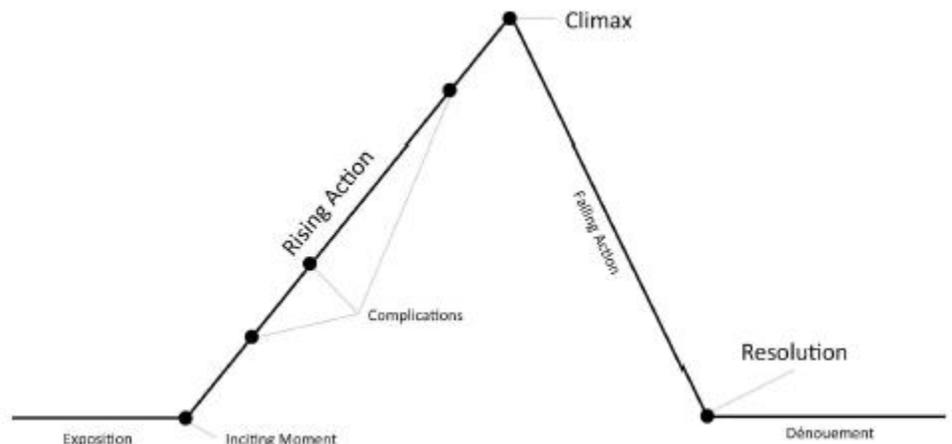
Complications can be internal struggles or external forces the subject attempts to overcome.

The **climax** is the moment the story has been building towards. It is typically the critical and deciding moment of a story.

Falling action is the part of the story that covers the fallout caused by the climax. It also signals the end of the story is coming soon.

Resolution is the part of the story where the main conflict or issue is resolved.

The **dénouement** is the ending of the story where any remaining questions can be explained.



Storytelling Concepts

Setting

Setting is the time, place and location a story takes place within and helps set the mood of a piece.

Scene

A scene is a sequence of actions revealed to move a story closer to the climax or to reveal points essential to the story's overall theme.

Character

A character is the person responsible for the thoughts and actions in a story. Characters help tell the story through their actions, dialogue, mannerisms, appearance and thoughts.

Point Of View

Point of view is the camera position of a story. In literature there are three types of point of view:

1. **First person.** First person point of view is where the author/producer shows the story from their position. "I did this. The snow fell on me. My dog barked."
2. **Second person.** Second person point of view is where the author/producer shows the story as if the reader/audience is the main character. "You did this. The snow fell on you. Your dog barked."
3. **Third person.** Third person point of view is where the author/producer shows the story through an outsider's point of view. "The Sailor did this. The snow fell on the Sailor. The Sailor's dog barked." Third person omniscient is a third person point of view where the thoughts of every character are known to the reader/audience. "I can't believe the Sailor did that," the Chief thought. Third person limited is where the thoughts of a single character are known.

Point of view also refers to the direction or viewpoint of a story and the distance a story is told from.

- **Direction/Viewpoint.** Point of view direction refers to which viewpoint the story is told. Will the story be told from a single character or from direction of a group of characters? Will the story be told from the viewpoint of the character who receives the action or from a character who watches the action unfold? These are decisions each producer/writer must select in order to tell the best story in the best possible way.
- **Distance.** Point of view distance refers to how close the producer or writer places the audience to the story. According to Jack Hart in "Storycraft", writers can put the audience extremely close to the point of view to vividly show a character's experience, thoughts and emotions. "But, as you step back from the action, you reveal more context, encompassing more abstract elements of reality that involve all of us." He added that when the author steps back from the action, the piece is written in summary narrative and when the author closes in the distance and gets close, the writing shifts to scenic narrative.

Point of View Examples

A story about a ship pulling into port can be told from many points of view.

First person. “I ironed my dress blues, shined my black shoes and rolled my white dixie hat just the way I liked it. I wanted to look sharp as we manned the rails and pulled back into port after being gone for half a year.”

Second person. “You iron your dress blues, shine your black shoes and roll your white dixie hat just the way you like it. You want to look sharp as you man the rails and pull back into port after being gone for half a year.”

Third person (Omniscient or Limited). “The Sailor irons his dress blues, shines his black shoes and rolls his white dixie hat just the way he likes it. He wants to look sharp as he mans the rails and pulls back into port after being gone for half a year.”

Direction/Viewpoint. The direction/viewpoint of this story could be told from the point of view of a Sailor aboard the ship getting ready to pull back into port. It could also be told from the point of view of a Sailor standing watch as the ship enters port and watches everyone disembark and be greeted by loved ones on the pier. And it could also be told from the point of view from a family member or friend on the pier waiting for their Sailor. Each shift in viewpoint changes the story told even though they are all about the same event.

Distance. If the producer/writer wanted to tell this story using in the summary narrative form the point of view could be of a long shot of all the Sailors lining the ship at parade rest. “Sailors aboard USS This Ship manned the rails as the ship entered port after a six-month deployment.” If the producer/writer want to this story using scenic narrative, the point of view could be from a single Sailor talking on the phone telling her loved-ones on the pier where she was standing. “Do you see the missile launcher on the left side of the ship? I’m just above it and the flight deck. I’m waving,” Fireman Ima Sailor told her Mom. “Do you see me yet?” Distance changes in a story allow the producer/audience to more fully tell a story.

Dialogue

Dialogue is a conversation between people. It is a storytelling device used in movies, plays and in fiction and narrative non-fiction. Dialogue is not direct quotation. “Dialogue involves the reader more completely than any other single device,” Tom Wolfe in his introduction to *The New Journalism*.

Description

Description is the strategy of using sensory details to portray a person, place or thing. There are two types of description: Objective and Impressionistic.

Objective Description

“Objective description attempts to report accurately the appearance of the object as a thing in itself, independent of the observer's perception of it or feelings about it. It is a factual account, the purpose of which is to inform a reader who has not been able to see with his own eyes.”
(Kane and Peters, 1986)

Impressionistic description

“Impressionistic description is very different. Focusing upon the mood or feeling the object evokes in the observer rather than upon the object as it exists in itself, impressionism does not seek to inform but to arouse emotion. It attempts to make us feel more than to make us see.” (Kane and Peters, 1986)

Photographer Jay Maisel said, “You are responsible for every part of your image, even the parts you’re not interested in.” Everything that is visible in the frame should communicate a singular idea. Everything that distracts from the idea should be left outside the frame when the shutter falls.

It is up to the reporter, then to take in all of the elements that fall within the framework of the story and to provide the detailed description to establish context. You could tell the reader a Sailor carried tie down chains across the flight deck, or you could tell the reader the Sailor carried 102 lb. tie down chains designed to secure a seven ton aircraft.

Where the first description says a Sailor works hard, the second description illustrates the challenge and importance of that work.

Storytelling Color

According to Jack Hart in his book “A Writer’s Coach”, well-chosen detail can reach people in ways generalizations cannot. “Abstract writing can inform and persuade,” writes Hart. “But it cannot bring readers to genuine sadness, or horror, or euphoria.” Detail – storytelling color – can do that though. Hart added that there’s a physiological reason for the power of detail. “Abstract thinking originates in the cerebral cortex, the highest and most recently evolved part of the brain. But emotion emerges from the ancient core of the brain as a direct result of external stimulation. Because descriptive writing that’s rich in telling detail can approximate experience, it can also reproduce a human being’s emotional response to experience.”

Be precise with details to make the story vivid. Are you describing a ship or a 9,200-ton guided-missile destroyer? The details will bring your story to life, but can, when executed poorly, disrupt the pace of the piece. Use the details that are necessary to your story’s theme to propel it along and incite an emotional response from your readers. If the added description doesn’t meet either of those requirements, edit it out.

Theme

Theme is the common thread or repeated idea that is incorporated throughout a story. It is the bigger and deeper meaning the author/producer wants to convey. Themes tend to be universal in nature and provide relatable concepts and ideas that everyone understands at some level.

“Theme is the glue that allows an audience to invest in the story, to feel that the story is in any way important, to respond emotionally to the story in any authentic, lasting way. Theme is the element that, if executed properly, makes audiences want to see the film again and want to have all their friends see the film to experience what they experienced. No other element, no matter how sound, can do that. The biggest spectacles fail to drive that kind of emotional response and expanding interest without strong theme.” (Deer, 2014)

Statistics for Storytelling

“Gathering, filtering and visualizing what is happening beyond what the eye can see has a growing value. The orange juice you drink in the morning, the coffee you brew — in today’s global economy there are invisible connections between these products, other people and you. The language of this network is data: little points of information that are often not relevant in a single instance, but massively important when viewed from the right angle.” From the [Data Journalism Handbook](#).

Mean, Median and Mode

The **mean** is the simple average. It is the sum of all the values divided by the number of data points.

Example:

Nine Sailors aboard your ship take a Damage Control proficiency test on July 1. To pass the test, Sailors must score 80% or higher. The test had 100 questions. Below are the numbers of correct responses from each Sailor:

76	80	74	92	84	72	100	84	52
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To get the mean (average) for the number of questions Sailors answered correctly, you add all the test scores.

$$76 + 80 + 74 + 92 + 84 + 72 + 100 + 84 + 52 = 714$$

Then, you divide the sum of the values (714) by the number of data points (9). ($714/9 = 79.33$)

The mean is 79.33.

<continued on next page>

The **median** is the middle value in a distribution of data. To find the median, the data has to be listed in numerical order. Half the sample is below that value and half is above. If the number of data points is an even number, the median is the average of the middle values.

To get the median for the Damage Control test, you have to first reorder the test scores in numerical order.

52	72	74	76	80	84	84	92	100
1	2	3	4	5	6	7	8	9

The middle value in this data set is the fifth value set, 80.

The **mode** is the value that occurs the most often in the data set. In this example, the mode is 84.

Knowing that a passing score is 80% or higher, the following statements are all true:

- The average test score for the ship's Damage Control proficiency test July 1 was 79.33% -- a failing grade.
- More Sailors passed the test than failed. The median score was 80%.
- More Sailors scored 84% on the test than any other score.

Even though all three statements are factual, which one is most useful and represents the data set best?

Percent change

Percent change can be used to show a change in data values.

Nine Sailors aboard your ship took a Damage Control proficiency test on July 1 and the mean score was 79.33 (714 correct answers out of 900 total questions). Your ship revamped its Damage Control training and another test was given August 1. The mean score on the Aug. 1 test was 85.00.

$$\text{Percent change} = \frac{\text{New number} - \text{Old number}}{\text{Old Number}} \times 100\%$$

$$\text{Percent change} = \frac{85.00 - 79.33}{79.33} \times 100\%$$

$$\text{Percent change} = \frac{5.67}{79.33} \times 100\% = 7.14\%$$

$$\text{Percent change} = +7.14\%$$

Percent change is used to help people understand the relationship between numbers.

With this knowledge, you each of the following sentences are accurate:

- “The ship’s revamped damage control training resulted in test scores increasing from an average of 79.33% in July to 85% in August.”
- “Damage control proficiency test scores increased 7.14% from July to August.”
- “The ship’s revamped damage control training resulted in a 7.14% increase in test scores from July to August.”

Ratios, Rates, Proportions, and Percentages

A helpful way to “normalize” comparisons is using ratios, rates, proportions, and percentages. What’s the difference between these four?

A *ratio* is a comparison of two terms expressed as a quotient. For example, USS NIMITZ produced 0.264 tons of recycle for every ton of refuse. Ratios can be expressed as “x to y,” “x:y,” “x/y,” or as a decimal.

A *rate* is a ratio in which the two terms have different units. For example, the max speed of a WASP-Class Amphibious Assault ship is 26 miles per hour. Rates are often predictive because time can be used as the denominator.

A *proportion* is a ratio in which the numerator is a partial amount and the denominator is the total amount (expressed as a number between 0 and 1). For example, the proportion of U.S. Aircraft Carriers homeported in Washington State is 0.2. A proportion is expressed as a number between 0 and 1.

A *percentage* is a ratio comparing a number to 100. For example, 20% of U.S. Aircraft Carriers are homeported in Washington State. A percentage is generally a number between 0 and 100, but can be larger than 100 (e.g., “sales have increased by 150% year-over-year”).

These types of normalized comparisons can make for much more interesting messages to communicate.

(Source: “Communicating Data with Tableau” by Ben Jones (Publisher: O'Reilly Media, Inc., *Release Date: July 2014*, ISBN: 9781449372026)

Statistical Terms

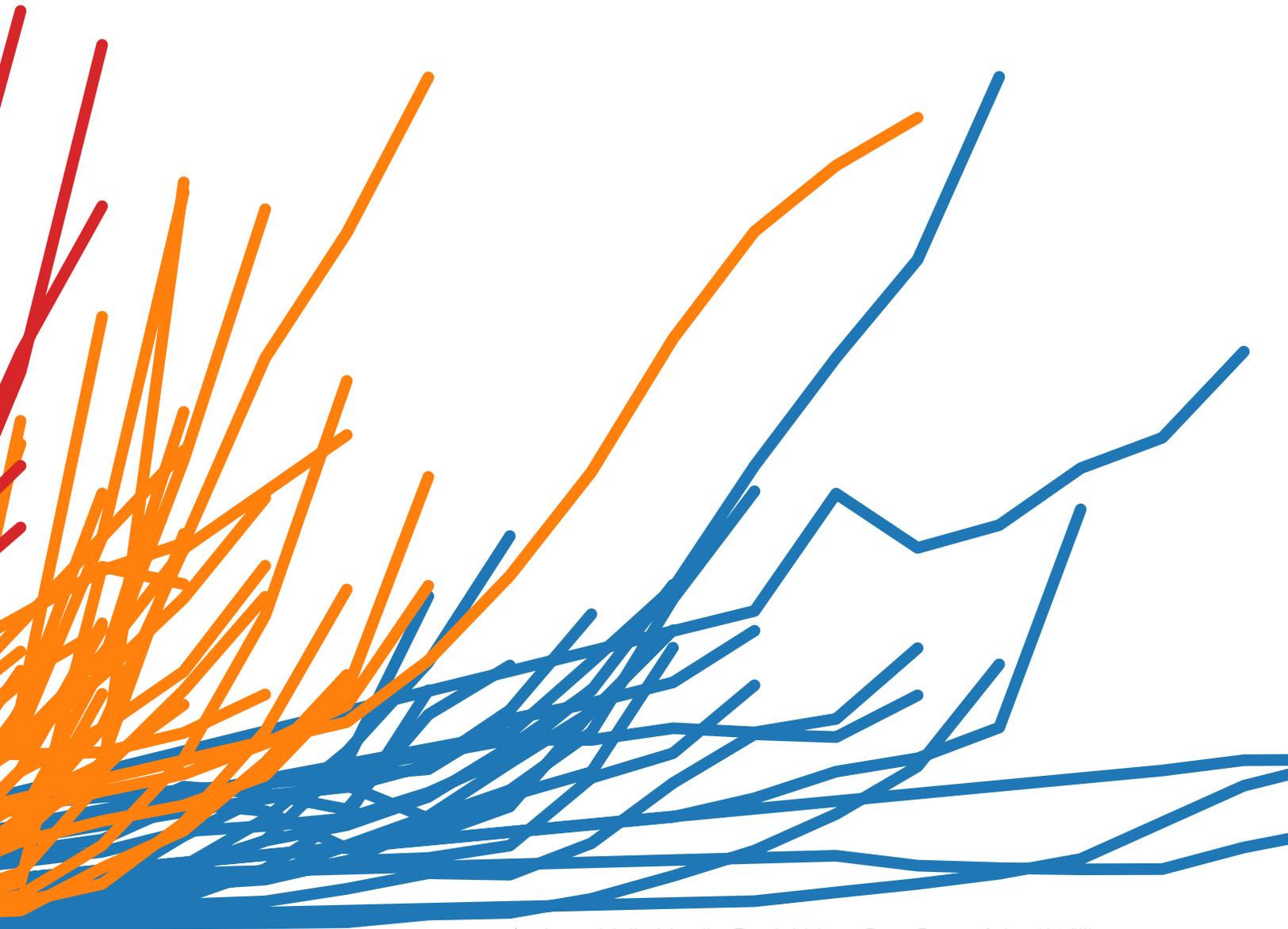
Correlation. When two sets of data are strongly linked together, researchers say they have a High Correlation. Correlation is called *Positive* when the values increase together. Correlation is *Negative* when one value decreases as the other increases.

Causation. Causation indicates that one event is the result of the occurrence of the other event; i.e. there is a causal relationship between the two events. This is also referred to as cause and effect. It is important to remember that even if two data sets correlate, it does not necessarily mean one data set causes the other.

Descriptive statistics. Through exploring observed data, descriptive statistics aim to summarize a sample.

Inferential statistics. Inferential statistics try to infer from the sample data what the population might think or to make judgments of the probability that an observed difference between groups is a dependable one or one that might have happened by chance.

Sample. A sample is a portion of an entire population. There are two primary types of population samples: random and stratified. For a random sample, study subjects are chosen completely by chance, while a stratified sample is constructed to reflect the characteristics of the population at large (gender, age or ethnicity, for example).



Authors: Maila Hardin, Daniel Hom, Ross Perez, & Lori Williams

Which chart or graph is right for you?

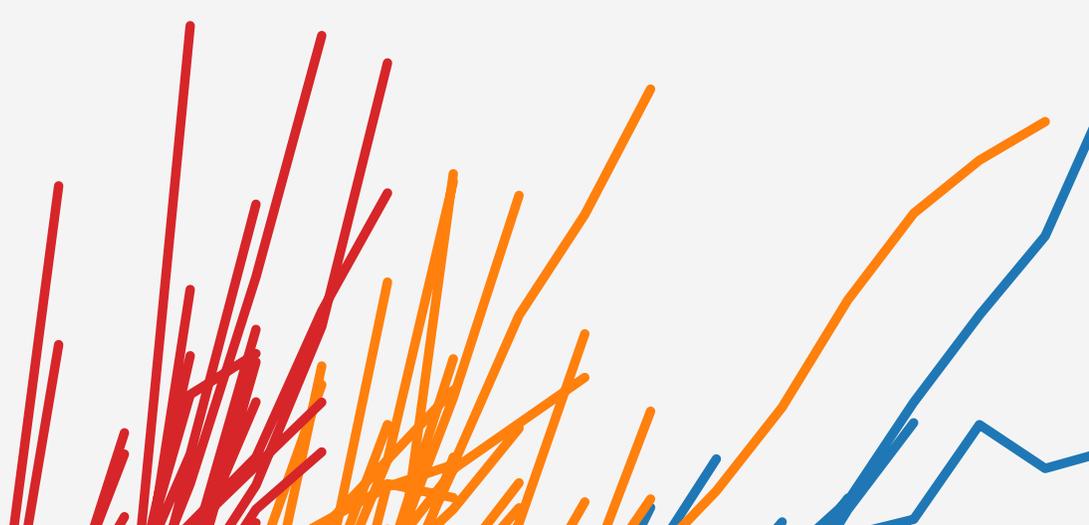
You've got data and you've got questions. Creating a chart or graph links the two, but sometimes you're not sure which type of chart will get the answer you seek.

This paper answers questions about how to select the best charts for the type of data you're analyzing and the questions you want to answer. But it won't stop there.

Stranding your data in isolated, static graphs limits the number of questions you can answer. Let your data become the centerpiece of decision making by using it to tell a story. Combine related charts. Add a map. Provide filters to dig deeper. The impact? Business insight and answers to questions at the speed of thought.

Which chart is right for you? Transforming data into an effective visualization (any kind of chart or graph) is the first step towards making your data work for you. In this paper you'll find best practice recommendations for when to create these types of visualizations:

1. Bar chart
2. Line chart
3. Pie chart
4. Map
5. Scatter plot
6. Gantt chart
7. Bubble chart
8. Histogram chart
9. Bullet chart
10. Heat map
11. Highlight table
12. Treemap
13. Box-and-whisker plot



|.

Bar chart

Bar charts are one of the most common ways to visualize data. Why? It's quick to compare information, revealing highs and lows at a glance. Bar charts are especially effective when you have numerical data that splits nicely into different categories so you can quickly see trends within your data.

When to use bar charts:

- **Comparing data across categories.** Examples: Volume of shirts in different sizes, website traffic by origination site, percent of spending by department.

Also consider:

- **Include multiple bar charts on a dashboard.** Helps the viewer quickly compare related information instead of flipping through a bunch of spreadsheets or slides to answer a question.
- **Add color to bars for more impact.** Showing revenue performance with bars is informative, but overlaying color to reveal profitability provides immediate insight.
- **Use stacked bars or side-by-side bars.** Displaying related data on top of or next to each other gives depth to your analysis and addresses multiple questions at once.
- **Combine bar charts with maps.** Set the map to act as a "filter" so when you click on different regions the corresponding bar chart is displayed.
- **Put bars on both sides of an axis.** Plotting both positive and negative data points along a continuous axis is an effective way to spot trends.

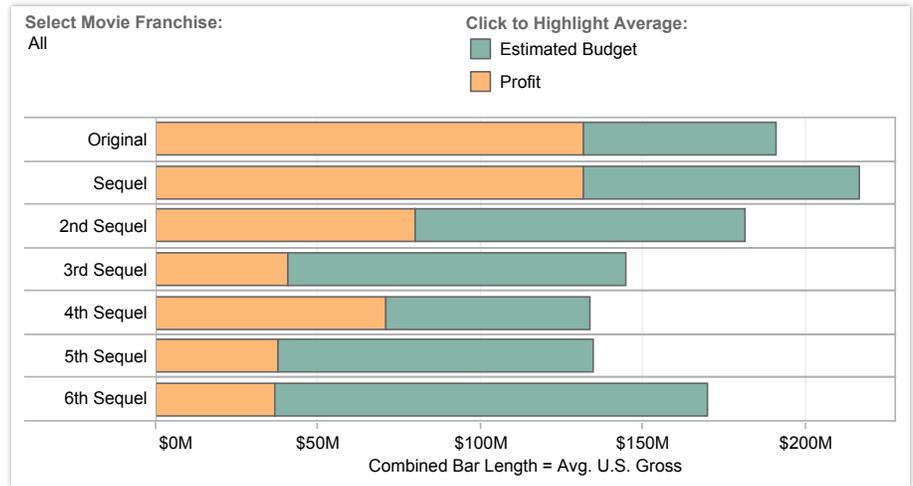


Figure 1: Tell stories with bar charts

Are film sequels profitable? In this example of a bar chart, you quickly get a sense of how profitable sequels are for box office franchises. *Select the chart* and use the drop-down filter to see the profit for your favorite movie franchise.

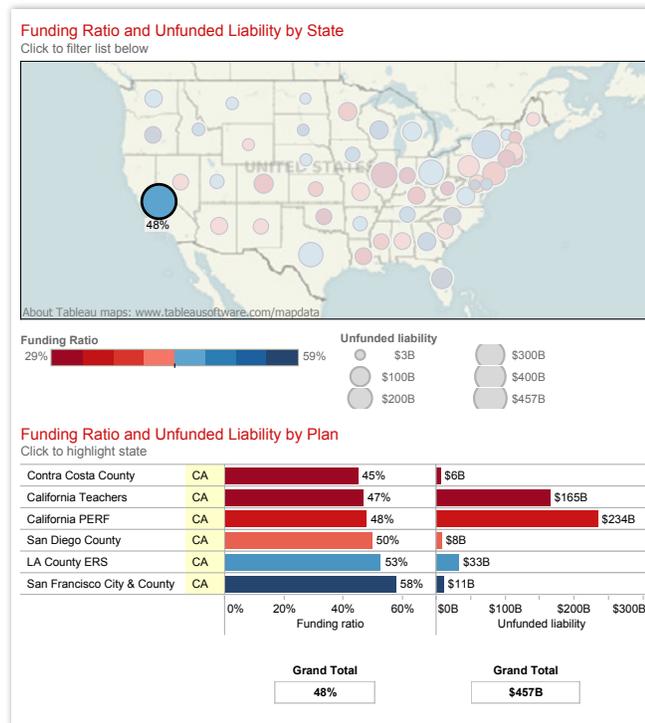


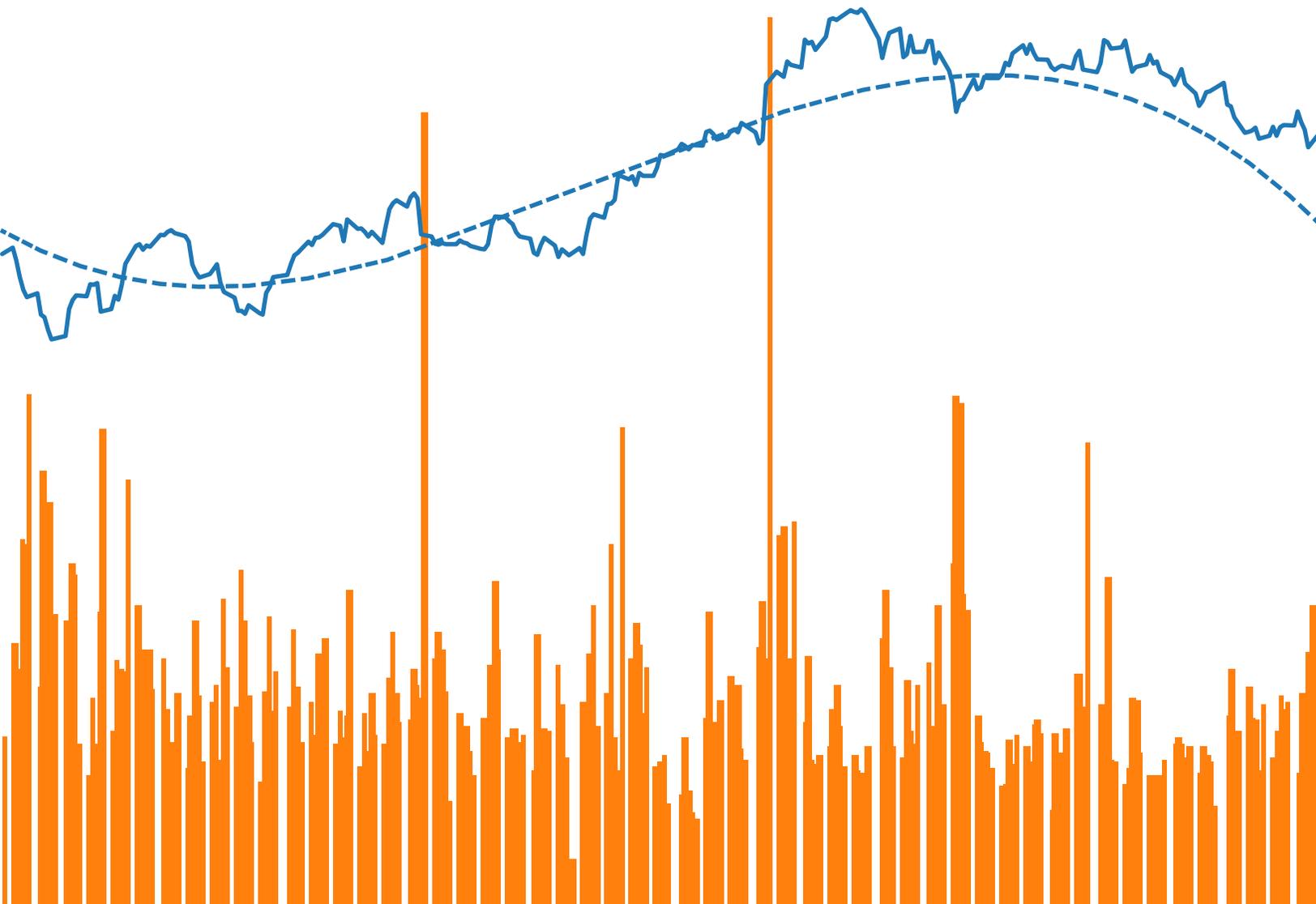
Figure 2: Combine bar charts and maps

Don't settle for a bar chart that leaves you scrolling to find the answers you seek. By combining a bar chart with a map, this dashboard showing public pension funding ratios in the U.S. provides rich information at a glance. When California is selected, for example, the bar chart filters to show state-specific information. *Check out another state* to see their funding ratio.



Tableau is one of the best tools out there for creating really powerful and insightful visuals. We're using it for analytics that require great data visuals to help us tell the stories we're trying to tell to our executive management team.

– Dana Zuber, Vice President - Strategic Planning Manager, Wells Fargo



2.

Line chart

Line charts are right up there with bars and pies as one of the most frequently used chart types. Line charts connect individual numeric data points. The result is a simple, straightforward way to visualize a sequence of values. Their primary use is to display trends over a period of time.

When to use line charts:

- **Viewing trends in data over time.** Examples: stock price change over a five-year period, website page views during a month, revenue growth by quarter.

Also consider:

- **Combine a line graph with bar charts.** A bar chart indicating the volume sold per day of a given stock combined with the line graph of the corresponding stock price can provide visual queues for further investigation.
- **Shade the area under lines.** When you have two or more line charts, fill the space under the respective lines to create an area chart. This informs a viewer about the relative contribution that line contributes to the whole.

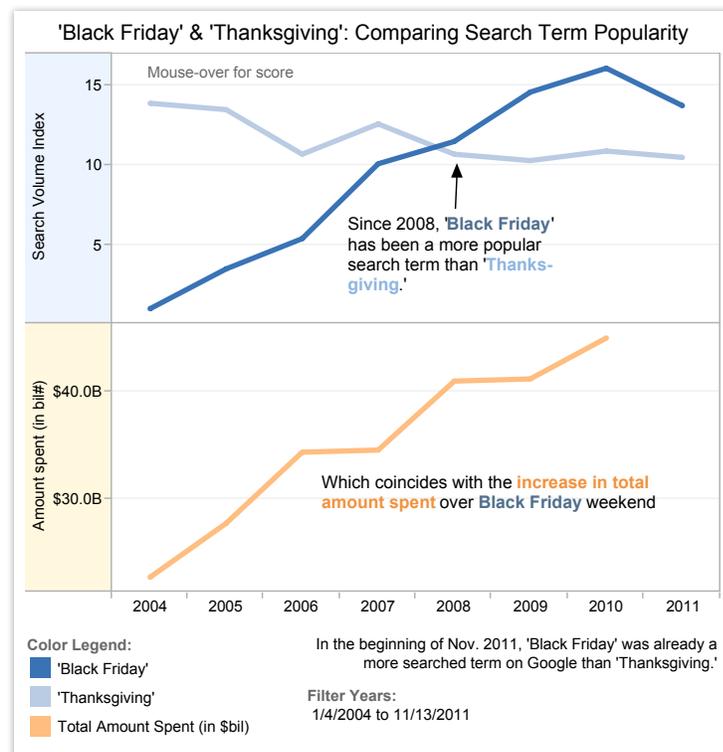


Figure 3: Basic lines reveal powerful insight

These two line charts illuminate the increasing popularity of "Black Friday" as an epic event in the United States. It's quick to see that Thanksgiving lost ground to the popular shopping period in 2008.

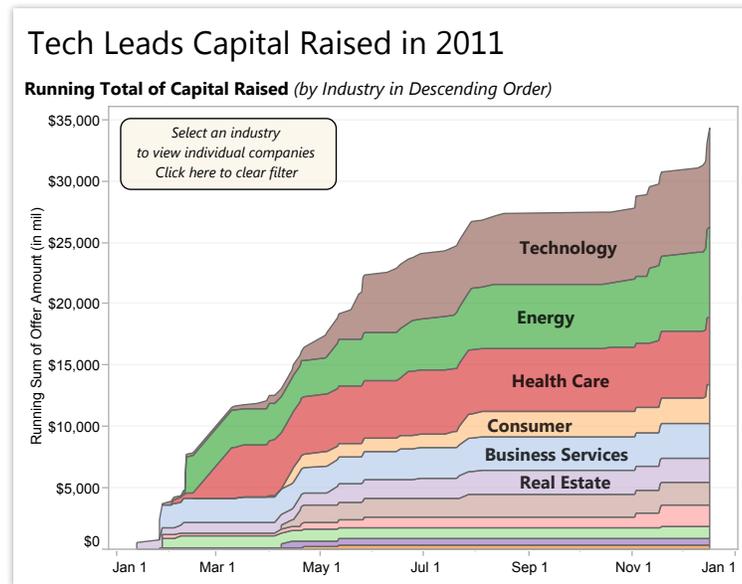


Figure 4: Transform line charts into area charts

Often when you have two or more sets of data in a line chart it can be helpful to shade the area under the line. In this chart, it's easy to tell that companies in the technology sector raised more capital than real estate in 2011.

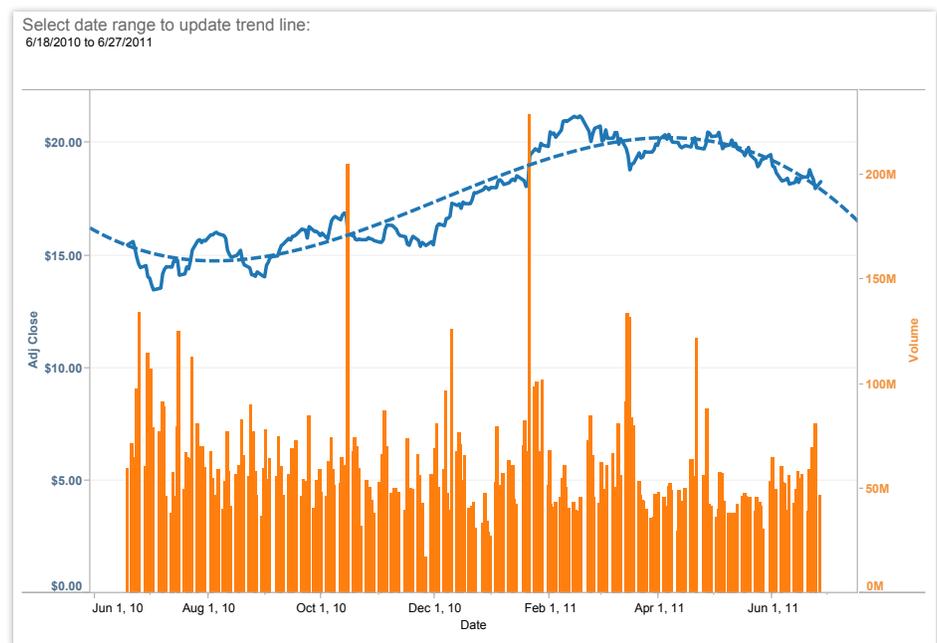


Figure 5: Combine line charts with bar and trend lines

Line charts are the most effective way to show change over time. In this case, GE's stock performance over a one-year period is joined with trading volume during the same time frame. At a glance you can tell there were two significant events, one resulting in a sell-off and the other a gain for shareholders. [Click the graph](#) and use the filter to select a different date range.

3.

Pie chart

Pie charts should be used to show relative proportions – or percentages – of information. That's it. Despite this narrow recommendation for when to use pies, they are made with abandon. As a result, they are the most commonly mis-used chart type. If you are trying to compare data, leave it to bars or stacked bars. Don't ask your viewer to translate pie wedges into relevant data or compare one pie to another. Key points from your data will be missed and the viewer has to work too hard.

When to use pie charts:

- **Showing proportions.** Examples: percentage of budget spent on different departments, response categories from a survey, breakdown of how Americans spend their leisure time.

Also consider:

- **Limit pie wedges to six.** If you have more than six proportions to communicate, consider a bar chart. It becomes too hard to meaningfully interpret the pie pieces when the number of wedges gets too high.
- **Overlay pies on maps.** Pies can be an interesting way to highlight geographical trends in your data. If you choose to use this technique, use pies with only a couple of wedges to keep it easy to understand.

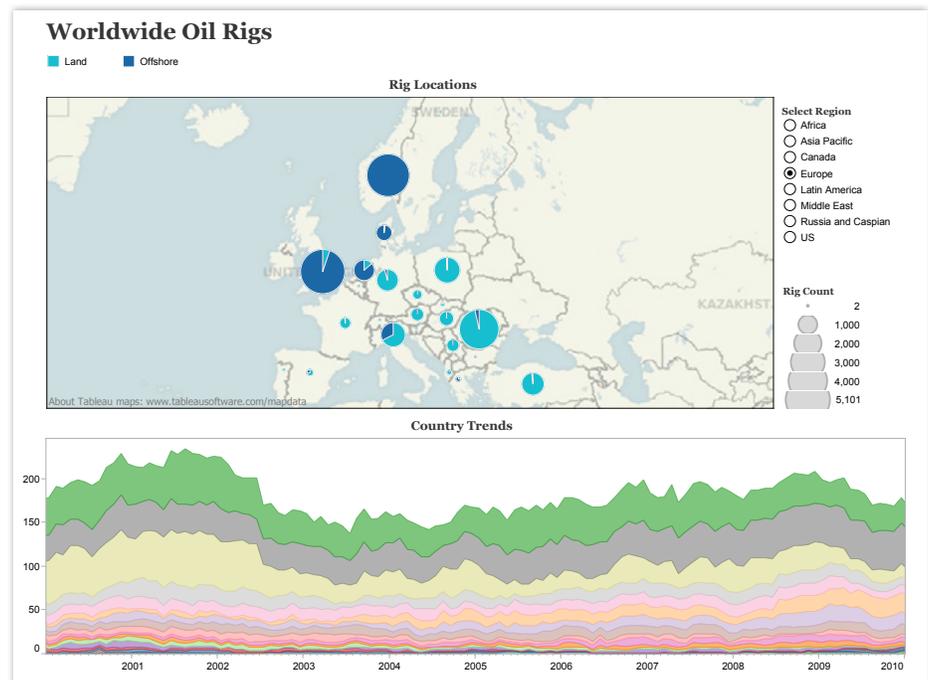


Figure 6: Use pies only to show proportions

Pie charts give viewers a fast way to understand proportional data. Using pie charts on [this map](#) shows the distribution of oil rigs on land vs. offshore in Europe.

4.

Map

When you have any kind of location data – whether it's postal codes, state abbreviations, country names, or your own custom geocoding – you've got to see your data on a map. You wouldn't leave home to find a new restaurant without a map (or a GPS anyway), would you? So demand the same informative view from your data.

When to use maps:

- **Showing geocoded data.** Examples: Insurance claims by state, product export destinations by country, car accidents by zip code, custom sales territories.

Also consider:

- **Use maps as a filter for other types of charts, graphs, and tables.** Combine a map with other relevant data then use it as a filter to drill into your data for robust investigation and discussion of data.
- **Layer bubble charts on top of maps.** Bubble charts represent the concentration of data and their varied size is a quick way to understand relative data. By layering bubbles on top of a map it is easy to interpret the geographical impact of different data points quickly.

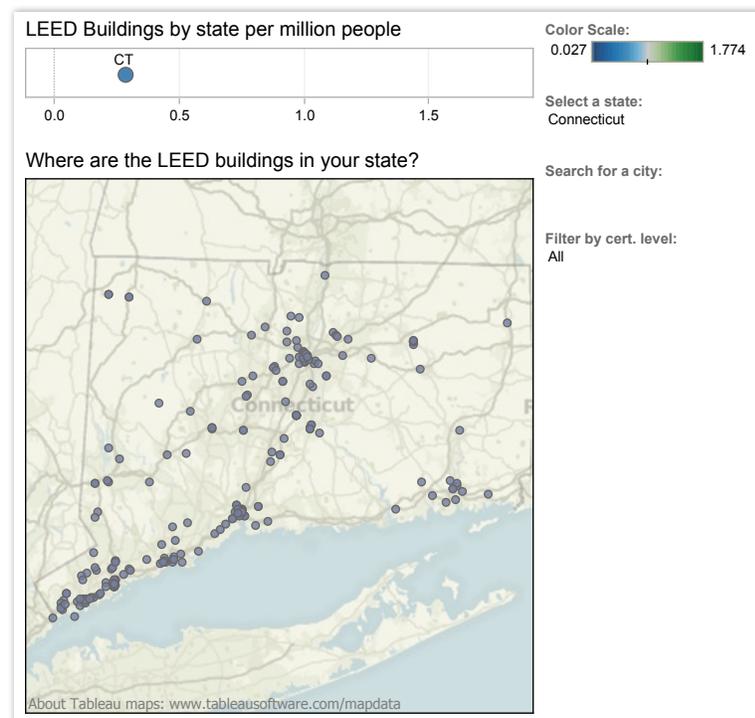


Figure 7: Provide street-level data on a map

Maps are a powerful way to visualize data. In this visualization you can zero in on every LEED certified building in the United States based on their street address.

Select any state or city to find the greenest buildings in that area.

5.

Scatter plot

Looking to dig a little deeper into some data, but not quite sure how – or if – different pieces of information relate? Scatter plots are an effective way to give you a sense of trends, concentrations and outliers that will direct you to where you want to focus your investigation efforts further.

When to use scatter plots:

- **Investigating the relationship between different variables.** Examples: Male versus female likelihood of having lung cancer at different ages, technology early adopters' and laggards' purchase patterns of smart phones, shipping costs of different product categories to different regions.

Also consider:

- **Add a trend line/line of best fit.** By adding a trend line the correlation among your data becomes more clearly defined.
- **Incorporate filters.** By adding filters to your scatter plots, you can drill down into different views and details quickly to identify patterns in your data.
- **Use informative mark types.** The story behind some data can be enhanced with a relevant shape

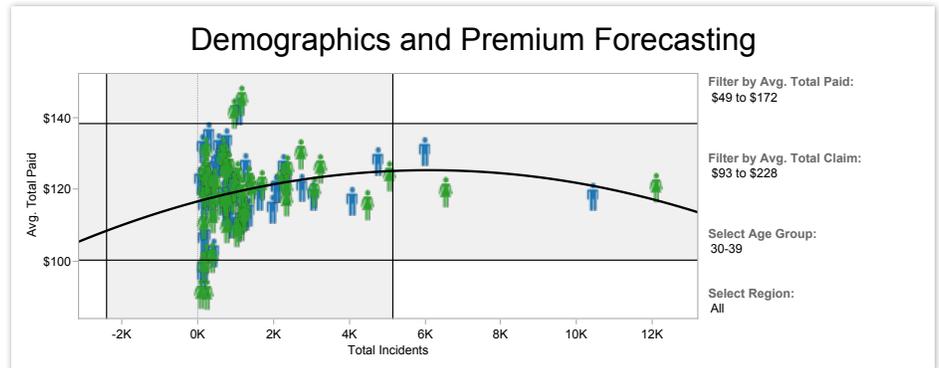


Figure 8: Who is most expensive to insure?
 Use an informative icon or “mark type” such as the female and male icons for additional detail in your scatter plot. *Select the graph* and filter to see how demographics change insurance premium forecasting for an employer.

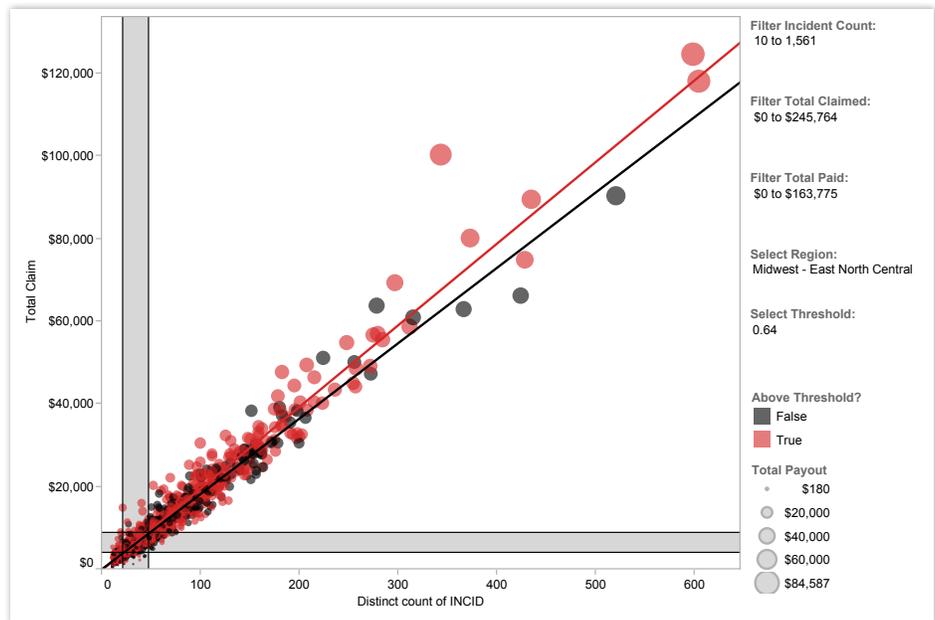
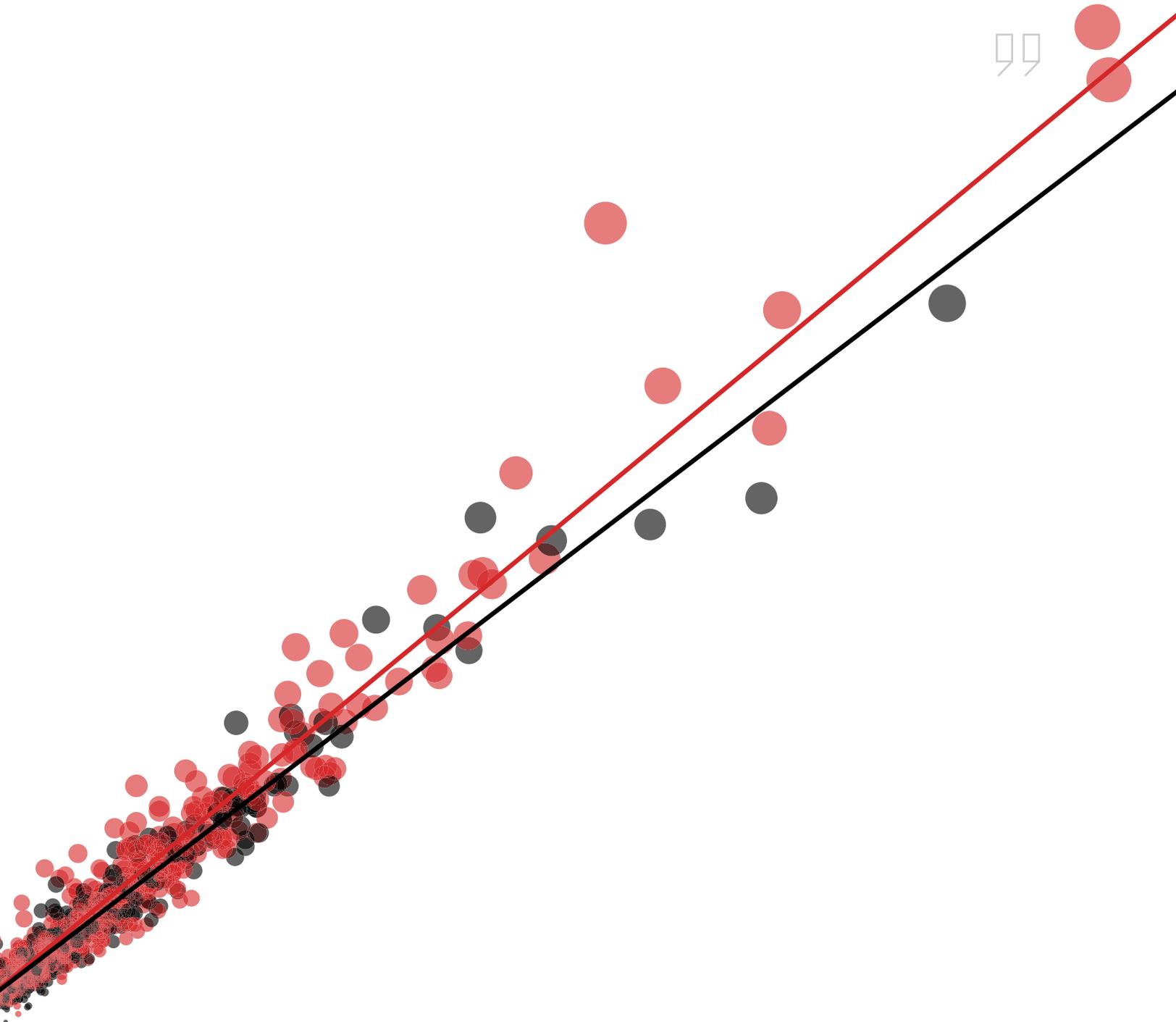


Figure 9: Can you spot the fraud?
 Using scatter plots is a quick, effective way to spot outliers that might warrant further investigation. By creating *this interactive scatter plot*, an insurance investigator can quickly evaluate where they might have fraudulent activity.



Visualizing data using color, shapes, positions on X and Y axes, bar charts, pie charts, whatever you use, makes it instantly visible and instantly significant to the people who are looking at it.

– Jon Boeckstedt, Associate Vice President Enrollment Policy and Planning, DePaul University



6.

Gantt chart

Gantt charts excel at illustrating the start and finish dates elements of a project. Hitting deadlines is paramount to a project's success. Seeing what needs to be accomplished – and by when – is essential to make this happen. This is where a Gantt chart comes in.

While most associate Gantt charts with project management, they can be used to understand how other things such as people or machines vary over time. You could use a Gantt, for example, to do resource planning to see how long it took people to hit specific milestones, such as a certification level, and how that was distributed over time.

When to use Gantt charts:

- **Displaying a project schedule.** Examples: illustrating key deliverables, owners, and deadlines.
- **Showing other things in use over time.** Examples: duration of a machine's use, availability of players on a team.

Also consider:

- **Adding color.** Changing the color of the bars within the Gantt chart quickly informs viewers about key aspects of the variable.
- **Combine maps and other chart types with Gantt charts.** Including Gantt charts in a dashboard with other chart types allows filtering and drill down to expand the insight provided.

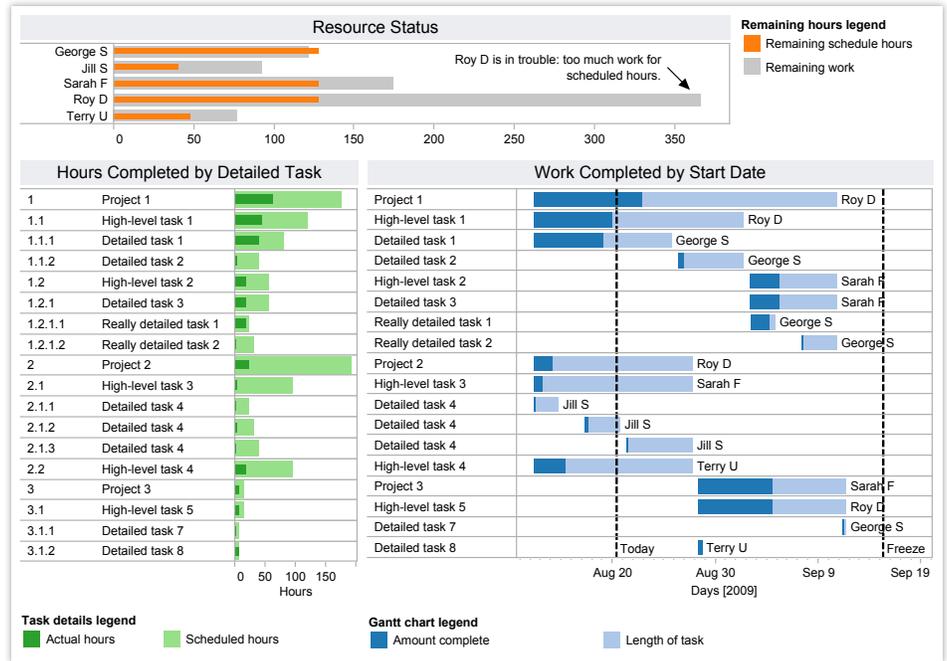


Figure 10: Manage project effectively

A Gantt chart is the centerpiece of this dashboard, providing a complete overview of tasks, owners, due dates, and status. By providing a menu of tasks at the top, a project manager can drill down as needed to make informed decisions.

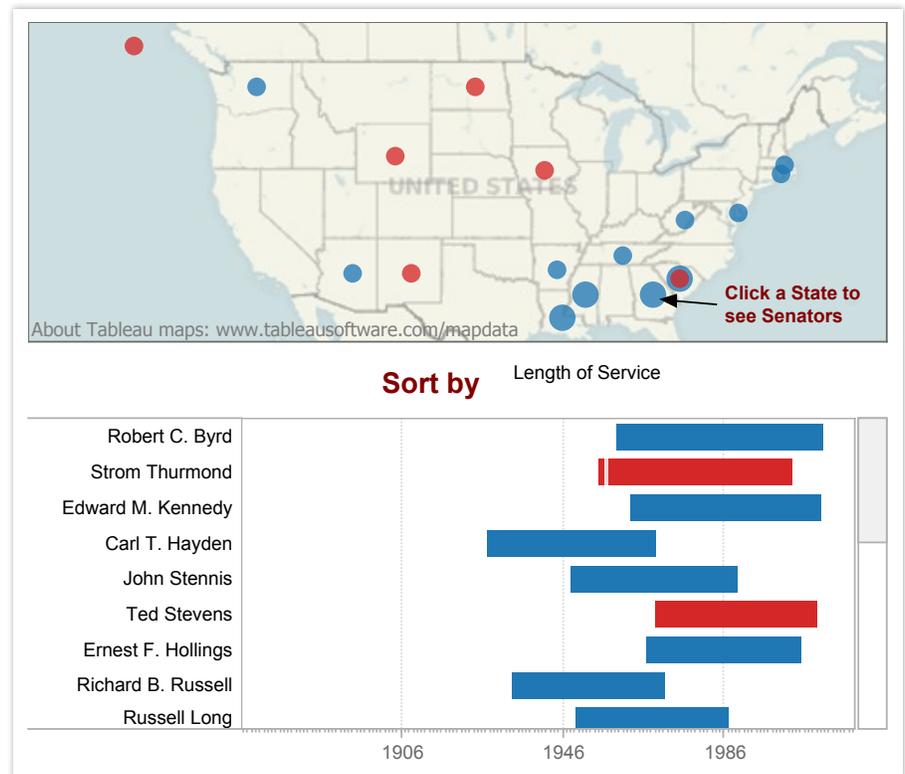


Figure 11: Who served the longest?

With a quick glance, this Gantt chart lets you know which U.S. senator held office the longest and which side of the aisle they represented. Select the visualization and use the drop down menu to see criteria such as party.

7.

Bubble chart

Bubbles are not their own type of visualization but instead should be viewed as a technique to accentuate data on scatter plots or maps. Bubbles are not their own type of visualization but instead should be viewed as a technique to accentuate data on scatter plots or maps. People are drawn to using bubbles because the varied size of circles provides meaning about the data.

When to use bubbles:

- **Showing the concentration of data along two axes.** Examples: sales concentration by product and geography, class attendance by department and time of day.

Also consider:

- **Accentuate data on scatter plots:** By varying the size and color of data points, a scatterplot can be transformed into a rich visualization that answers many questions at once.
- **Overlay on maps:** Bubbles quickly inform a viewer about relative concentration of data. Using these as an overlay on map puts geographically-related data in context quickly and effectively for a viewer.

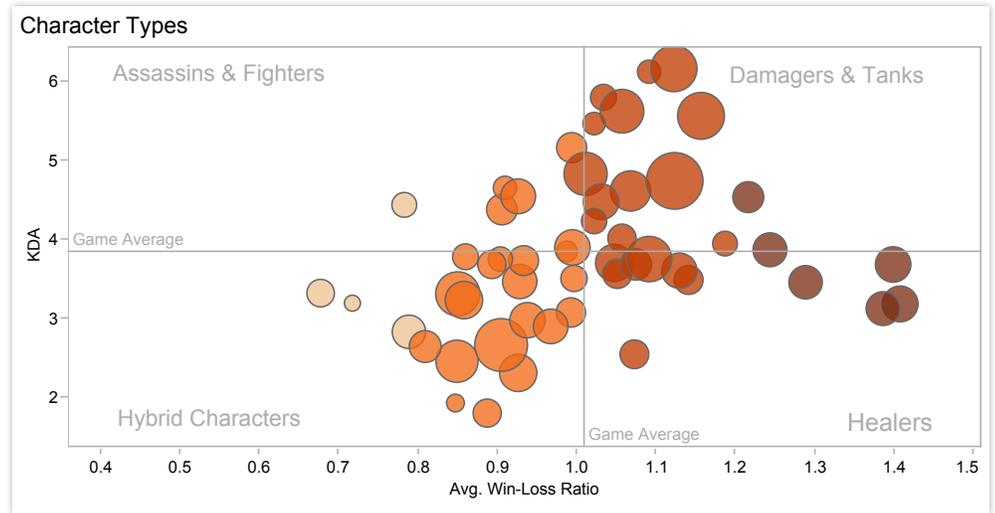


Figure 12: Add data depth with bubbles

In this scatter plot accentuated with bubbles, the varied size and color of circles make it quick to see how the game's players compare. [Click this dashboard](#) then scroll over the bubbles to get instant access to more detailed information about each character.



Figure 13: Oil imports and exports at a glance

It's easy to tell who buys and sells the most oil with green bubbles for net exporters and red for net importers overlaid on this map. [Select a country on the map](#) and the dashboard reveals details about consumption history.

8.

Histogram chart

Use histograms when you want to see how your data are distributed across groups. Say, for example, that you've got 100 pumpkins and you want to know how many weigh 2 pounds or less, 3-5 pounds, 6-10 pounds, etc. By grouping your data into these categories then plotting them with vertical bars along an axis, you will see the distribution of your pumpkins according to weight. And, in the process, you've created a histogram.

At times you won't necessarily know which categorization approach makes sense for your data. You can use histograms to try different approaches to make sure you create groups that are balanced in size and relevant for your analysis.

When to use histograms:

- **Understanding the distribution of your data.** Examples: Number of customers by company size, student performance on an exam, frequency of a product defect.

Also consider:

- **Test different groupings of data.** When you are exploring your data and looking for groupings or "bins" that make sense, creating a variety of histograms can help you determine the most useful sets of data.
- **Add a filter.** By offering a way for the viewer to drill down into different categories of data, the histogram becomes a useful tool to explore a lot of data views quickly.

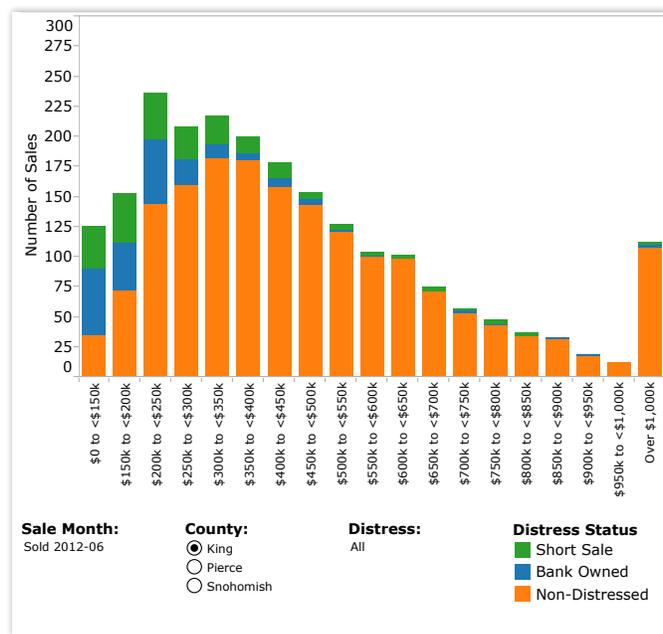


Figure 14: Which houses are selling?

This histogram shows which houses are seeing the most sales in a month. *Explore for yourself* how the histogram changes when you select a different month, county, or distress level.

9.

Bullet chart

When you've got a goal and want to track progress against it, bullet charts are for you. At its heart, a bullet graph is a variation of a bar chart. It was designed to replace dashboard gauges, meters and thermometers. Why? Because those images typically don't display sufficient information and require valuable dashboard real estate.

Bullet graphs compare a primary measure (let's say, year-to-date revenue) to one or more other measures (such as annual revenue target) and presents this in the context of defined performance metrics (sales quota, for example). Looking at a bullet graph tells you instantly how the primary measure is performing against overall goals (such as how close a sales rep is to achieving her annual quota).

When to use bullet graphs:

- **Evaluating performance of a metric against a goal.** Examples: sales quota assessment, actual spending vs. budget, performance spectrum (great/good/poor).

Also consider:

- **Use color to illustrate achievement thresholds.** Including color, such as red, yellow, green as a backdrop to the primary measure lets the viewer quickly understand how performance measures against goals.
- **Add bullets to dashboards for summary insights.** Combining bullets with other chart types into a dashboard supports productive discussions about where attention is needed to accomplish objectives.

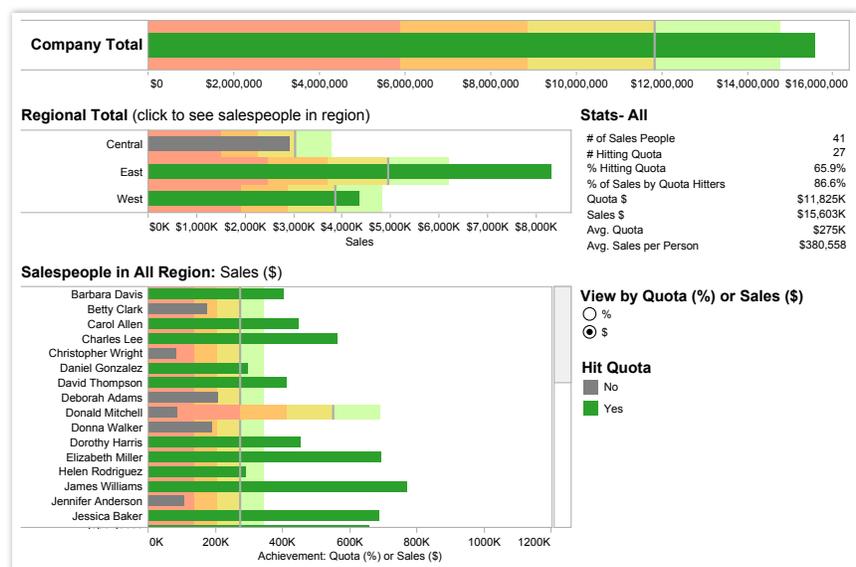


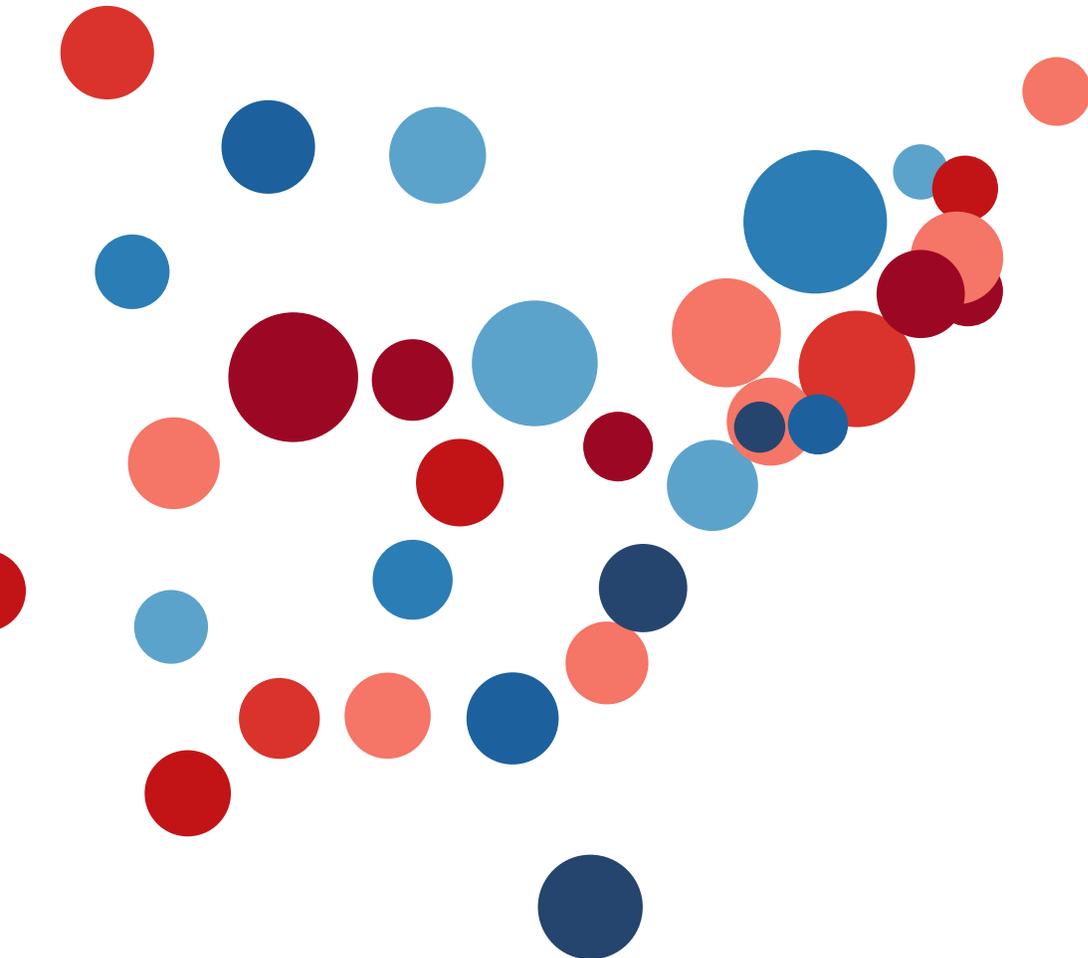
Figure 15: Have you hit your quota?

Tracking a sales team's progression to hitting its quota is a critical element to managing success. In this *quota dashboard*, a sales manager can quickly select to view her team's performance by quota percentage or sales amount as well as zero in on regional achievement.



Tableau has many great visualization capabilities. We use a lot of mapping, not only to show the geographical location, but also to do a lot of geocoding and we map relationships with geocoding the distances.

– Marta Magnuszewska, Intelligence Data Analyst, Allstate Insurance



10.

Heat maps

Heat maps are a great way to compare data across two categories using color. The effect is to quickly see where the intersection of the categories is strongest and weakest.

When to use heat maps:

- **Showing the relationship between two factors.** Examples: segmentation analysis of target market, product adoption across regions, sales leads by individual rep.

Also consider:

- **Vary the size of squares.** By adding a size variation for your squares, heat maps let you know the concentration of two intersecting factors, but add a third element. For example, a heat map could reveal a survey respondent's sports activity preference and the frequency with which they attend the event based on color, and the size of the square could reflect the number of respondents in that category.
- **Using something other than squares.** There are times when other types of marks help convey your data in a more impactful way.



Figure 16: Who buys the most books?

In this **market segmentation** analysis, the heat map reveals a new campaign idea. High-income households of people in their sixties buy children's books. Perhaps it's time for a new grandparent-oriented campaign?



Highlight table

Highlight tables take heat maps one step further. In addition to showing how data intersects by using color, highlight tables add a number on top to provide additional detail.

When to use highlight tables:

- **Providing detailed information on heat maps.** Examples: the percent of a market for different segments, sales numbers by a reps in a particular region, population of cities in different years.

Also consider:

- **Combine highlight tables with other chart types:** Combining a line chart with a highlight table, for example, lets a viewer understand overall trends as well as quickly drill down into a specific cross section of data.

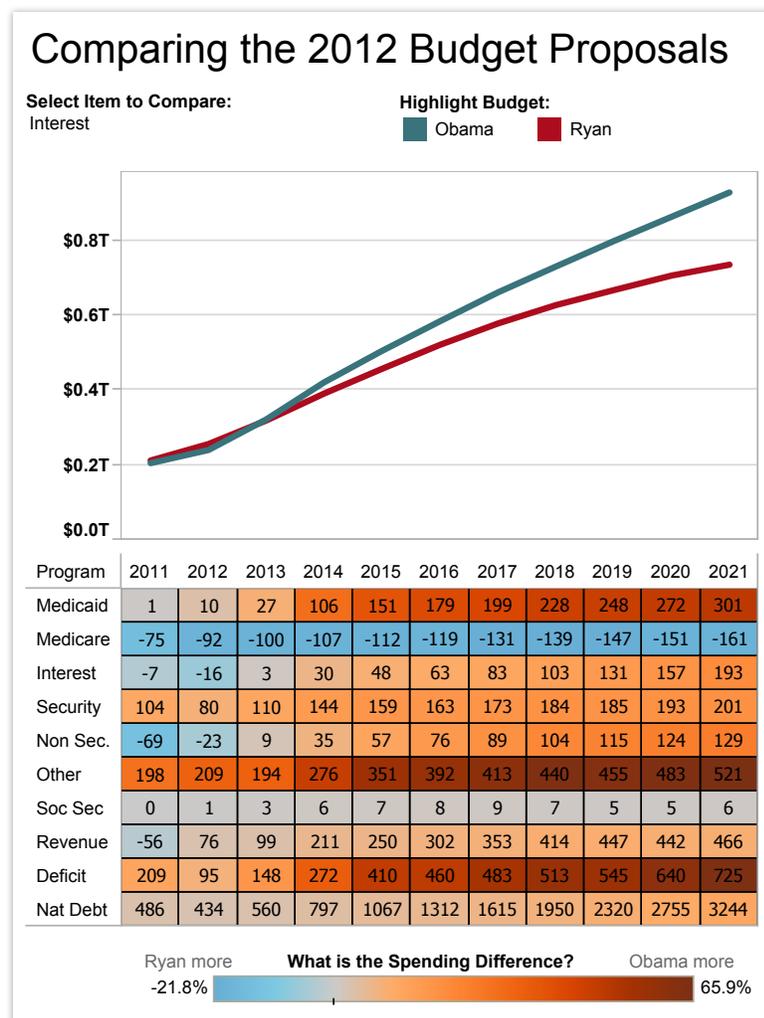


Figure 17: Highlight table shows spending difference

This highlight table compares two 2012 budget proposals for the U.S. [Click the table](#) to learn more.

12.

Treemap

Looking to see your data at a glance and discover how the different pieces relate to the whole? Then treemaps are for you. These charts use a series of rectangles, nested within other rectangles, to show hierarchical data as a proportion to the whole.

As the name of the chart suggests, think of your data as related like a tree: each branch is given a rectangle which represents how much data it comprises. Each rectangle is then sub-divided into smaller rectangles, or sub-branches, again based on its proportion to the whole. Through each rectangle's size and color, you can often see patterns across parts of your data, such as whether a particular item is relevant, even across categories. They also make efficient use of space, allowing you to see your entire data set at once.

When to use treemaps:

- **Showing hierarchical data as a proportion of a whole:** Examples: storage usage across computer machines, managing the number and priority of technical support cases, comparing fiscal budgets between years

Also consider:

- **Coloring the rectangles by a category** different from how they are hierarchically structured
- **Combining treemaps with bar charts.** In Tableau, place another dimension on Rows so that each bar in a bar chart is also a treemap. This lets you quickly compare items through the bar's length, while allowing you to see the proportional relationships within each bar.

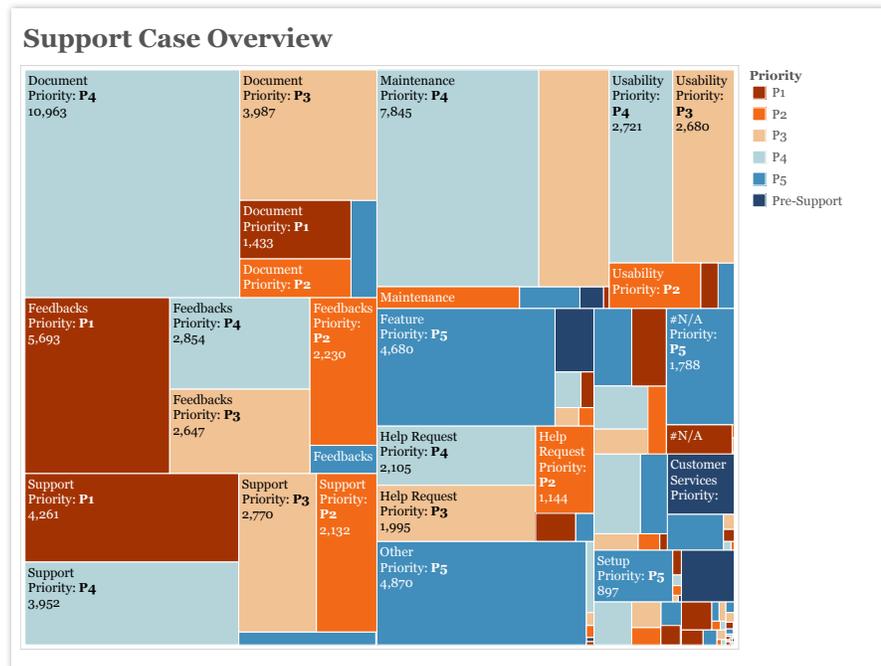


Figure 18: Support Cases at a Glance

This treemap shows all of a company's support cases, broken by case type, and also priority level. You can see that Document, Feedback, Support and Maintenance make up the lion share of support cases. However, in Feedback and Support, P1 cases make up the most number of cases, whereas most other categories are dominated by relatively mild P4 cases.

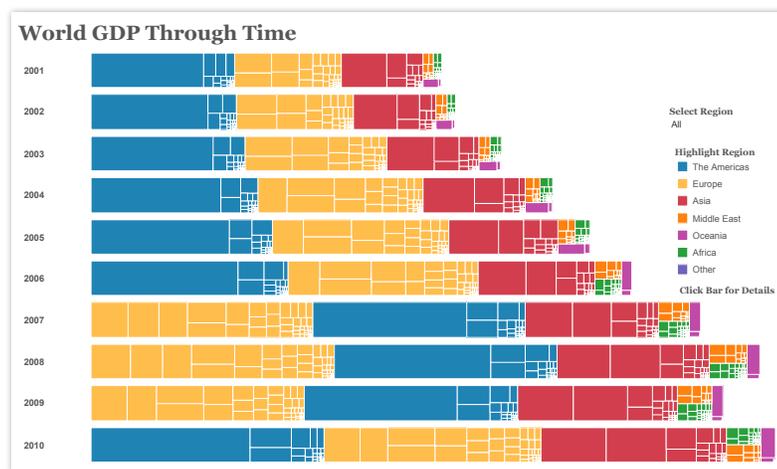


Figure 19: Visualizing World GDP

In this treemap-bar chart combination chart, we can see how overall GDP has grown over time (with the exception of 2009, when GDP fell), but also which regions and countries comprised most of the world's GDP. Since 2001, the region 'The Americas' made up most of the world's GDP, until 2007 for three years. You can also see that GDP for 'The Americas' is made up of largely one rectangle (one country), whereas 'Europe' is made up of rectangles that are more similar in size. Click a rectangle to see which country it represents and how much GDP was produced (and how much per capita).

13.

Box-and-whisker Plot

Box-and-whisker plots, or boxplots, are an important way to show distributions of data. The name refers to the two parts of the plot: the box, which contains the median of the data along with the 1st and 3rd quartiles (25% greater and less than the median), and the whiskers, which typically represents data within 1.5 times the Inter-quartile Range (the difference between the 1st and 3rd quartiles). The whiskers can also be used to also show the maximum and minimum points within the data.

When to use box-and-whisker plots:

- **Showing the distribution of a set of a data:** Examples: understanding your data at a glance, seeing how data is skewed towards one end, identifying outliers in your data.

Also consider:

- **Hiding the points within the box.** This helps a viewer focus on the outliers.
- **Comparing boxplots across categorical dimensions.** Boxplots are great at allowing you to quickly compare distributions between data sets.

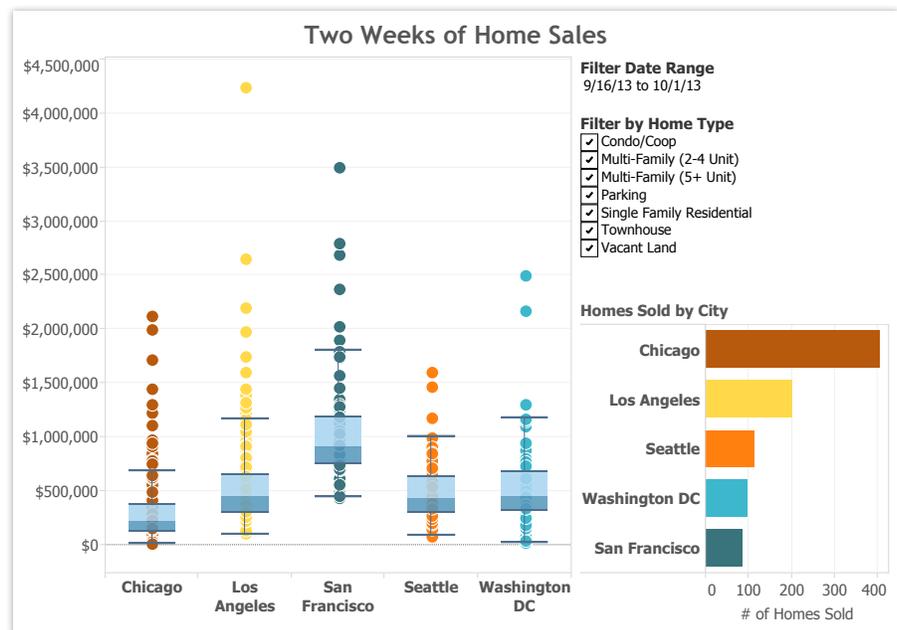
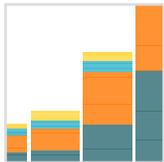
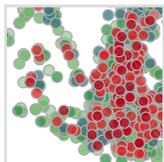
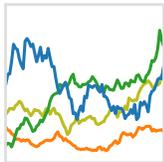


Figure 20: Comparing the sales prices of homes

For this time period, the median prices of homes sold were highest in San Francisco, but the distribution was wider for Los Angeles. In fact, the most expensive home in Los Angeles was sold at several times greater than the median. *Hover over a point* to see its geographic location and how much it sold for.

About Tableau

Tableau Software helps people see and understand data. Tableau helps anyone quickly analyze, visualize and share information. More than 15,000 customer accounts get rapid results with Tableau in the office and on-the-go. And tens of thousands of people use Tableau Public to share data in their blogs and websites. See how Tableau can help you by downloading the free trial at www.tableausoftware.com/trial.



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Visual Design Basics

Visual design focuses on the aesthetics of a site and its related materials by strategically implementing images, colors, fonts, and other elements. A successful visual design does not take away from the content on the page or function. Instead, it enhances it by engaging users and helping to build trust and interest in the brand.

Basic Elements of Visual Design

The basic elements that combine to create visual designs include the following:

Lines connect two points and can be used to help define shapes, make divisions, and create textures. All lines, if they're straight, have a length, width, and direction.

Shapes are self-contained areas. To define the area, the graphic artist uses lines, differences in value, color, and/or texture. Every object is composed of shapes.

Color palette choices and combinations are used to differentiate items, create depth, add emphasis, and/or help organize information. Color theory examines how various choices psychologically impact users.

Texture refers to how a surface feels or is perceived to feel. By repeating an element, a texture will be created and a pattern formed. Depending on how a texture is applied, it may be used strategically to attract or deter attention.

Typography refers to which fonts are chosen, their size, alignment, color, and spacing. Form applies to three-dimensional objects and describes their volume and mass. Form may be created by combining two or more shapes and can be further enhanced by different tones, textures, and colors.

Principles for Creating a Visual Design

A successful visual design applies the following principles to elements noted above and effectively brings them together in a way that makes sense. When trying to figure out how to use the basic elements consider:

Unity has to do with all elements on a page visually or conceptually appearing to belong together. Visual design must strike a balance between unity and variety to avoid a dull or overwhelming design.

Gestalt, in visual design, helps users perceive the overall design as opposed to individual elements. If the design elements are arranged properly, the Gestalt of the overall design will be very clear.

Space is "defined when something is placed in it", according to Alex White in his book, *The Elements of Graphic Design*. Incorporating space into a design helps reduce noise, increase readability, and/or create illusion. White space is an important part of your layout strategy.

Hierarchy shows the difference in significance between items. Designers often create hierarchies through different font sizes, colors, and placement on the page. Usually, items at the top are perceived as most important.

Balance creates the perception that there is equal distribution. This does not always imply that there is symmetry.

Contrast focuses on making items stand out by emphasizing differences in size, color, direction, and other characteristics.

Scale identifies a range of sizes; it creates interest and depth by demonstrating how each item relates to each other based on size.

Dominance focuses on having one element as the focal point and others being subordinate. This is often done through scaling and contrasting based on size, color, position, shape, etc.

Similarity refers to creating continuity throughout a design without direct duplication. Similarity is used to make pieces work together over an interface and help users learn the interface quicker.

Pulling it all together

Applying design principles to the basic elements can seem overwhelming at first but once you start pulling a page or concept together, it becomes easier. Below is an example homepage that features some of the principles in action:



- Color **contrast** was applied to the logo making the word “stop” stand out
- Text spacing and size creates a visual **hierarchy**
- Featured image in the carousel **dominates** over the smaller images below it to create a focal point
- **White space** is used around text and between sections to allow the page to breath
- **Textured** background to helps the elements on the page stand out on top of it
- Map showing **scale**
- **Lines** to divide sections
- **Shapes** to create buttons

Source: <https://www.usability.gov/what-and-why/visual-design.html>

Color Basics

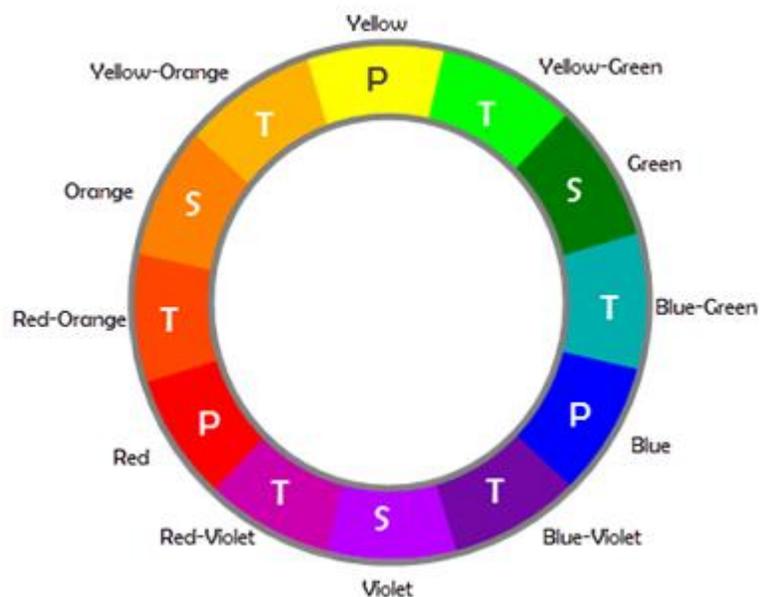
A color wheel is an illustrative model of color hues around a circle. It shows the relationships between the primary, secondary, and intermediate/ tertiary colors and helps demonstrate color temperature. Digital teams communicate exact colors through the use of hex codes.

Understanding the Color Wheel

Many color wheels are shown using 12 colors. Using this color wheel as an example, it can be read as follows:

- **Three Primary Colors (Ps):** Red, Yellow, Blue
- **Three Secondary Colors (S’):** Orange, Green, Violet
- **Six Tertiary Colors (Ts):** Red-Orange, Yellow-Orange, Yellow-Green, Blue-Green, Blue-Violet, Red-Violet, which are formed by mixing a primary with a secondary

It’s important to note that some people add more intermediates, for 24 total named colors, and some color wheels show interior points and circles, which represent color mixtures.



Color Temperature

The colors on the red side of the wheel are warm; the green side of the wheel has the cooler colors. These color temperature designations are absolute. More subtle color temperature relationships are relative, meaning that each color on the warm side of the wheel can be known as cool, and colors on the cool side of the wheel can be known as warm depending on the relationship to their neighboring color. Colors from the same hue, for instance red, can also be warmer or cooler than one another.

Color temperatures affect us both psychologically and perceptually by helping us determine how objects appear positioned.

Warm Colors	Cool Colors
 <ul style="list-style-type: none">• Warm colors include red, orange, and yellow, and variations of those three colors.• Red and yellow are both primary colors, with orange falling in the middle.• Warm colors appear closer to the observer.	 <ul style="list-style-type: none">• Cool colors include green, blue, and purple, and variations of those three colors.• Blue is the only primary color within the cool spectrum.• Greens take on some of the attributes of yellow and purple takes on some of the attributes of red.• They are often more subdued than warm colors.• Cool colors appear farther from the observer.

Neutrals

Neutral colors include black, white, gray, tans, and browns. They're commonly combined with brighter accent colors but they can also be used on their own in designs. The meanings and impressions of neutral colors depend more so upon the colors around them.

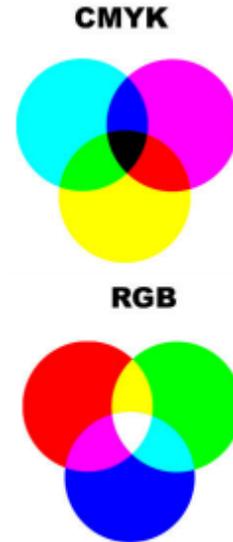


Color Models: CMYK vs. RGB

There are two models for colors. They have different purposes and different attributes. They are as follows:

CMYK Color Models: Stands for cyan, magenta, and yellow. It applies to painting and printing. The CMYK model is a subtractive model, meaning that colors are created through absorbing wavelengths of visible light. The wavelengths of light that don't get absorbed are reflected, and that reflected light ends up being the color we see.

RGB Color Models: RGB stands for red, green, and blue. It applies to computers, televisions, and electronics. The RGB model is an additive model, meaning that colors are created through light waves that are added together in particular combinations in order to produce colors.



Hex Codes

To name colors in web design, teams use hexadecimal code. All hexadecimal codes:

- Start with a hash mark (#)
- Consist of three pairs of characters sequenced together (totaling of six characters), with each pair controlling one of the primary additive colors (red, green, blue)
- Those six characters following the hash mark consist of ten numerals (0-9) and/ or six letters (a-f)

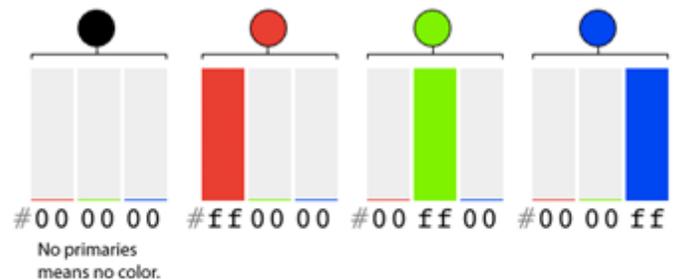


It is easy to identify patterns in the hex codes some colors; see [SmashingMagazine's great chart](#) at the right for this. Some things to know include:

- 00 is a lack of primary
- ff is the primary at full strength

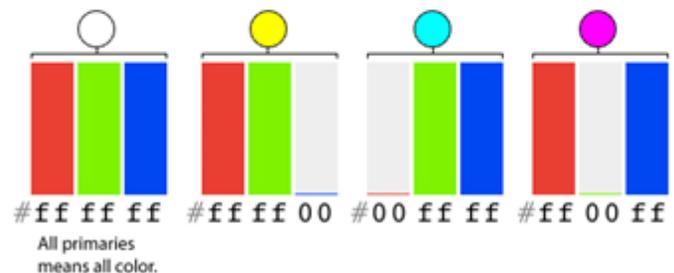
To find additive colors, start with black and change each pair to ff:

- #000000 is black (no primaries)
- #ff0000 is the brightest red
- #00ff00 is the brightest green
- #0000ff is the brightest blue



To find subtractive colors, start with white and

- change each pair to 00:
- #ffffff is white (all primaries)
- #00ffff is the brightest cyan
- #ff00ff is the brightest magenta
- #ffff00 is the brightest yellow



It is also possible to abbreviate some hex numbers. For instances #fae expands to #ffaeee and #09b expands to #0099bb.

Light and Lighting

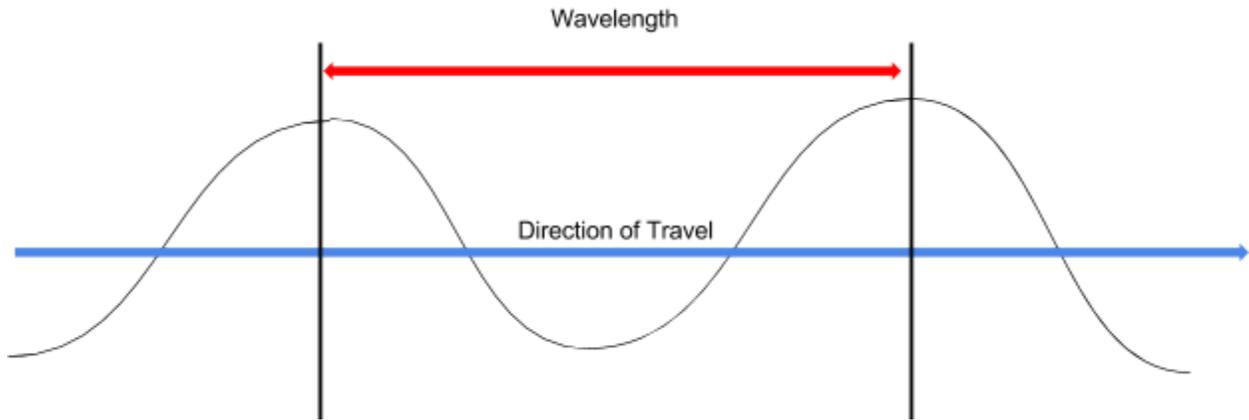
Describe the Theory of Light

Light is essential to both life and to the craft of the professional communicator. Photography quite literally means writing or drawing with light. Without light, there would be no photography or videography. The properties and characteristics of light have a direct impact on the product that an photographer is able to produce. As such, photographers are expected to be able to use light to their advantage in the course of their work. The techniques to do so will be covered in depth later in this guide.

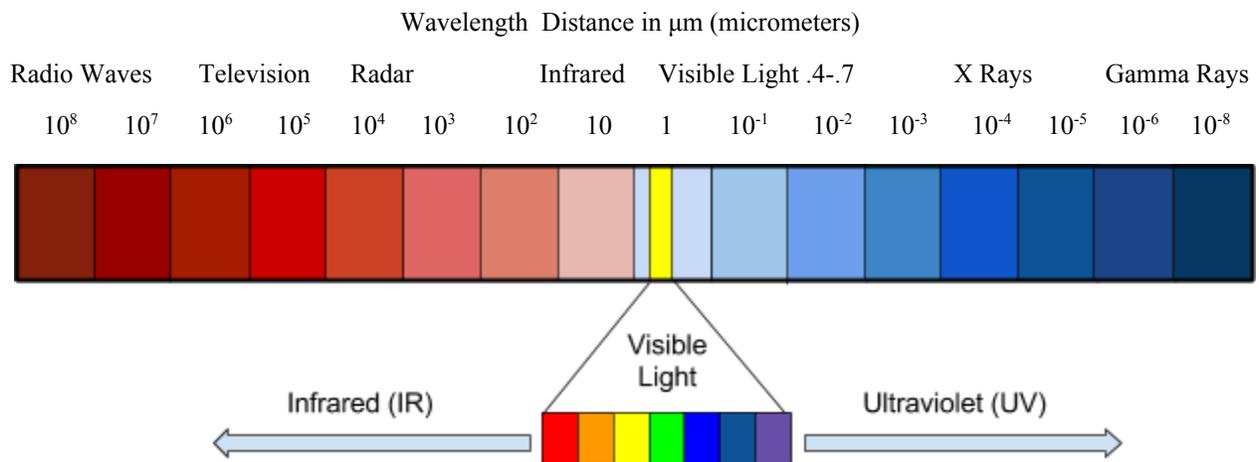
The building blocks of these techniques are an understanding of the Theory of Light. Though light is all around us, few photographers and videographers understand the nature of light and in that they are not alone. There is still debate in the scientific community about the nature of light. Simply put, light is a form of energy that radiates from a source. This source can be anything from the Sun to a simple lightbulb. Regardless of the source, light behaves both as separate energy particles and electromagnetic waves. (Zettl 19) Those electromagnetic waves make up the foundation of what is known as the electromagnetic spectrum, or in a more narrow sense, the spectrum of visible light.

Discuss the Electromagnetic Spectrum and Light Frequency

For the purposes of this discussion, let us disregard light particles and focus on the behavior of light as waves. Just like waves in water, electromagnetic waves have certain measurements to describe them. Wavelength is the distance from one peak to another in a wave of light.



Wavelength is measured in Nanometers or nm, which is one-thousandth of a millimeter. (Paine 3) It is important to note that though light travels in waves, it travels in a straight line radiating out from its source. The wavelength is the determining factor in where energy falls on the electromagnetic spectrum. For instance, the visible light spectrum is only between 400-700 nm. Energy at higher or lower wavelengths will present as infrared, gamma ray, x-ray, ultraviolet or microwave in accordance with the chart below:



The next measurement of light that concerns us is frequency. Frequency is the measurement of how many times a wave of light passes a given point in one second. Typically this measurement is expressed in the SI unit of hertz or Hz. 1 Hz is equal to 1 cycle per second, so for example a wheel rotating at 1 revolution per second, or 60 revolutions per minute (RPM) can also be described as having a frequency of 1 Hz.

Discuss the Following Light Behavior Principles

As light is radiated from a source, it is subject to certain principles in the way that it interacts with objects. A successful photographer or videographer knows and expects these interactions and is able to use them to their advantage. Keep in mind that the following principles are not just limited to light, they apply to all forms of energy on the electromagnetic spectrum. For the purposes of the following discussion, the term light has been chosen as it is the range of the electromagnetic spectrum that we are most likely to work with.

Before we begin describing the way that light behaves it is imperative to discuss the Law of Conservation of Energy as it has a direct bearing on the terms that follow. The law states:

In a closed system, energy is neither created nor destroyed, it is converted or transferred from one form to another

What this means for the photographer or videographer is that light is not created by your lighting instrument, it is merely converted from electrical energy to light. When you block light with a flag or modify it with a gel, it is not destroyed, just reflected or converted into thermal energy (heat).

Speed: The speed of light is variable depending on the properties of the surface that the light is passing through. For instance, the speed of light through air is 186,000 miles (299,000 kilometers) per second. (Paine 3) If light is passing through glass, for instance, it will slow down, and the wavelength will shorten but the frequency will remain the same. This is why we identify radiation and subsequently the color of light by its wavelength. Wavelength and the speed of light can be calculated using the following formulae:

$$\text{Speed} = \text{Wavelength} \times \text{Frequency}$$

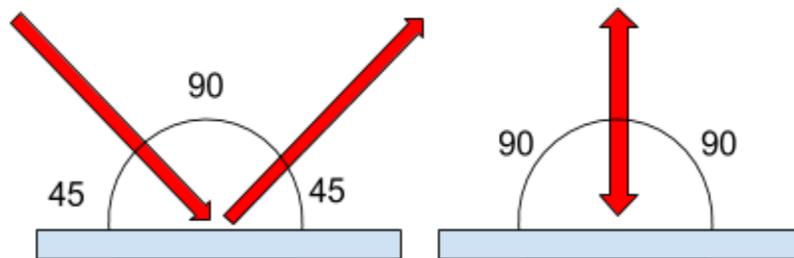
or

$$\text{Wavelength} = \text{Speed} / \text{Frequency}$$

It is important to note two further things when it comes to the behavior of light. First, light will always travel in a straight line in a given medium (material) and secondly, the speed of light travelling through the same material will be constant. Light will speed up or slow down as it passes from material to material and as a rule will revert back to 186,000 miles per second when it is passing through air.

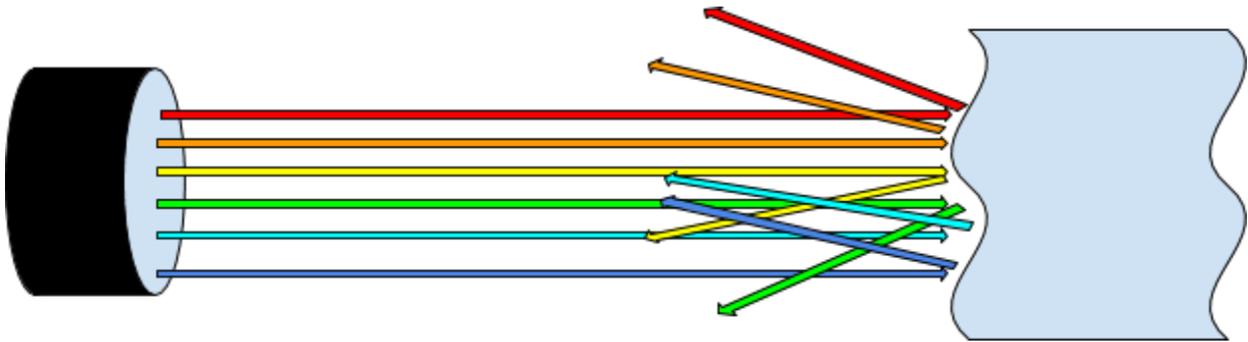
Reflection: Every time that light comes into contact with a surface, a variety of interactions may take place. The first of these interactions that we are going to discuss is reflection.

Reflection of light occurs when light from a source bounces off of a surface. There are a few things to note regarding reflection. First, the reflected light will always reflect in the same angle as it reached the surface. So, if light strikes a surface at an angle of 45 degrees, it will be reflected back at 45 degrees. As shown in the first diagram below, when reflecting off of a flat surface, the sum of all of the angles will always add up to 180 degrees.



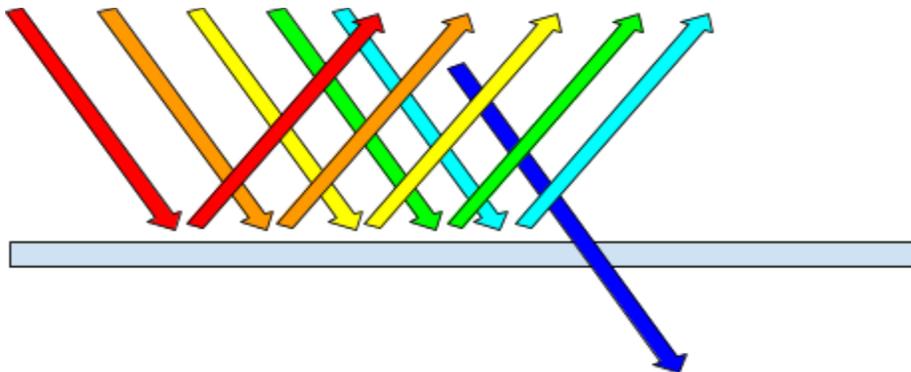
When the surface that the light is reflecting on is smooth, the resultant reflection will be orderly, or specular. Common examples of specular reflections would be mirrors or highly polished smooth metal. Specular reflections or highlights are easy to identify on photographs because they present as harsh often overexposed areas. Often the materials that light is reflecting off of is not smooth. Rough or textured surfaces diffuse or scatter light. This is a direct result of light from the light source reflecting at their complementary angles off of each of the imperfections in the

surface. This scattering of light creates a less harsh reflection, or a diffused reflection.



The less light that is reflected along the same axis as the eye or camera, the less harsh the reflection. This principle governing the behavior of light will become more important as we move into later topics.

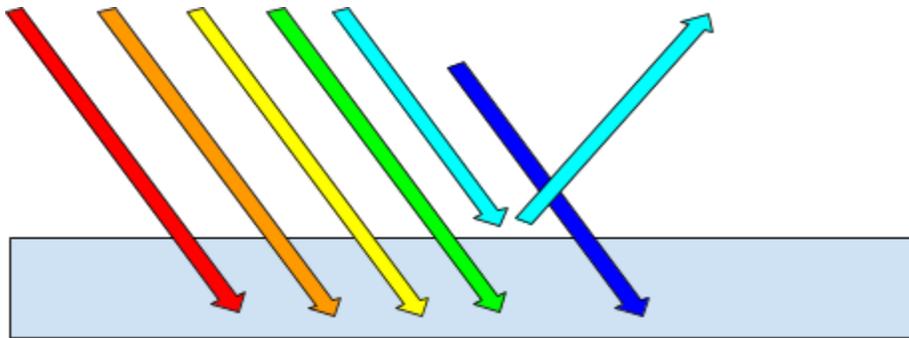
Transmission: Depending on the physical properties of the material that the light is hitting, not all of it may be reflected at a complementary angle to its source. Some of that light may pass through the object and emerge on the other side. Objects displaying these characteristics are said to be translucent, or clear depending on the wavelengths of light that they will allow to transit. There are many interactions that can take place within a medium that determines which light is transmitted, reflected or absorbed. These interactions also determine the properties of the light that may be transmitted.



In the example above, all light that is not dark blue is reflected from the surface, while dark blue light passes through the surface. The result of this example would be an object that appears blue to the eye while also changing white light into a dark blue light as it passes through, much like a

dark blue party gel. Multiple wavelengths of light can be reflected or transmitted through a surface depending on the properties of the surface.

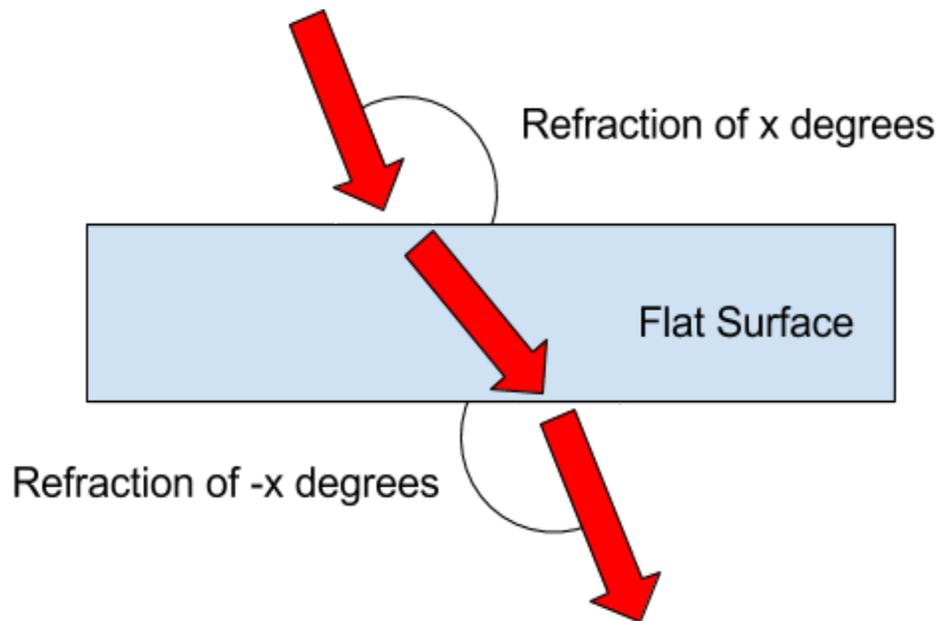
Absorption: In some cases, certain wavelengths of light are not transmitted, but either reflected or absorbed. Materials that are opaque fit into this category. The light that is reflected or absorbed by the opaque object will determine the color that the object appears to the naked eye, or to camera sensors for that matter. In the example below, all colors of light with the exception of light blue are absorbed by the material. Light blue is reflected from the surface resulting in an object that is light blue in color and opaque in nature.



As stated earlier, the color of the object is determined by the wavelengths of light that are absorbed, reflected, or transmitted. So, an opaque object that visually presents as black will absorb all wavelengths of light in the visible spectrum, allowing no absorption or transmission. Likewise, an opaque object that presents as white will reflect all wavelengths of visible light while allowing no transmission or absorption. Finally, an object that presents as clear will allow the transmission of all wavelengths of light with no absorption or reflection.

A final note on Absorption: Although light is interacting with a surface, it is still beholden to the Law of Conservation of Energy. If a material absorbs light energy, it has to convert that energy into another form in order to not violate the Law of Conservation of Energy. Most often this is accomplished by turning light energy into thermal energy, or heat. This is why black asphalt is hotter than white cement.

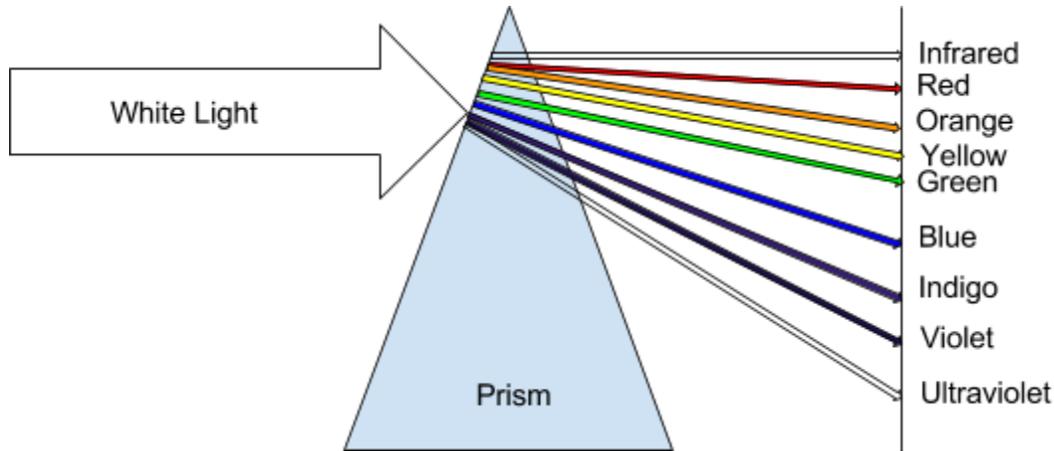
Refraction: As light is transmitted through a surface something interesting happens, its speed changes. As discussed in the Speed definition, the frequency of the light will remain constant as its speed changes, but its wavelength will change. Another side effect of this change in speed is that the light's direction will slightly change with each speed gradient. This direction change is referred to as refraction. If the both sides of the surface that the light is passing through are at the same angle, such as a flat pane of glass, the light will be refracted at the same angle that it entered the surface at.



The angle that light refracts as it transmits through a surface is directly related to the wavelength of the light. Remember, each wavelength of light represents a different color. As such, each color of light is refracted at a different angle. Light is only refracted when it hits a surface at an angle other than perpendicular to the surface. If light hits the surface perpendicular to that surface, it will pass through that surface, if it is not absorbed, at the same direction that it entered the surface.

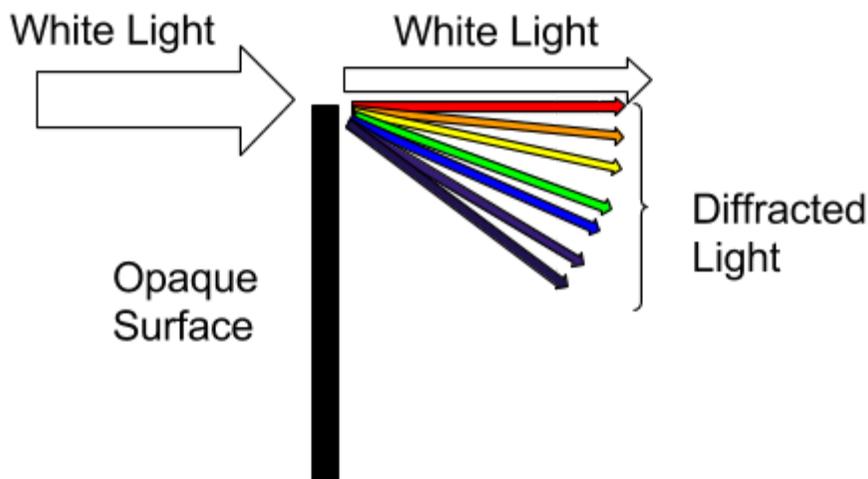
Dispersion: As mentioned in the previous section, different wavelengths of light refract at different angles depending on the material that they pass through. This separation of light is collectively known as dispersion. A very simple and common example of dispersion is white

light passing through a prism. As each wavelength of light enters the prism, they slow to different speeds and separate from one another, appearing as a rainbow that is emitted from the prism.

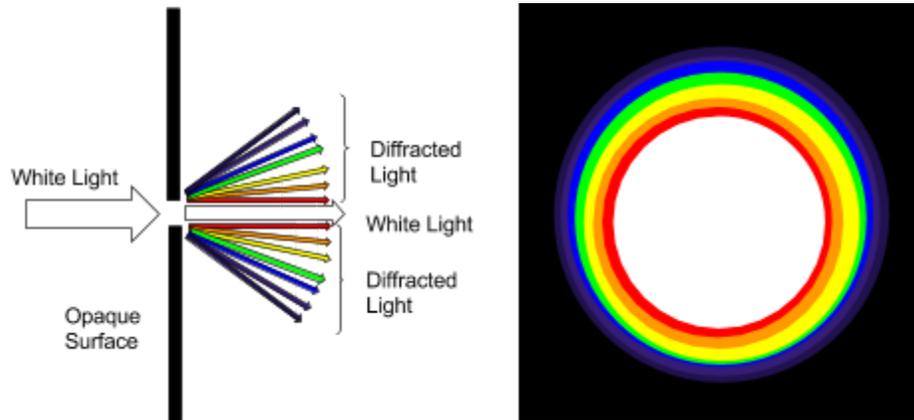


As demonstrated in the figure above, white light is broken into its constituent color wavelengths when passing through a prism. Note that Reflection, Refraction, Dispersion and Diffraction apply to all forms of energy along the electromagnetic spectrum. Just because you see the dispersion of white light into the visible color spectrum does not mean that there are not particles or wavelengths that you cannot see. i.e. Infrared or Ultraviolet.

Diffraction: Earlier it was stated that light always moves in a straight line. Diffraction is one instance where light does not follow that rule. When light is shined on an opaque edge, the light will bend slightly. As the light bends, it will separate into the wavelengths that make up the light.



Another example of diffraction occurs when a light is shone through a small gap or hole in an opaque surface.

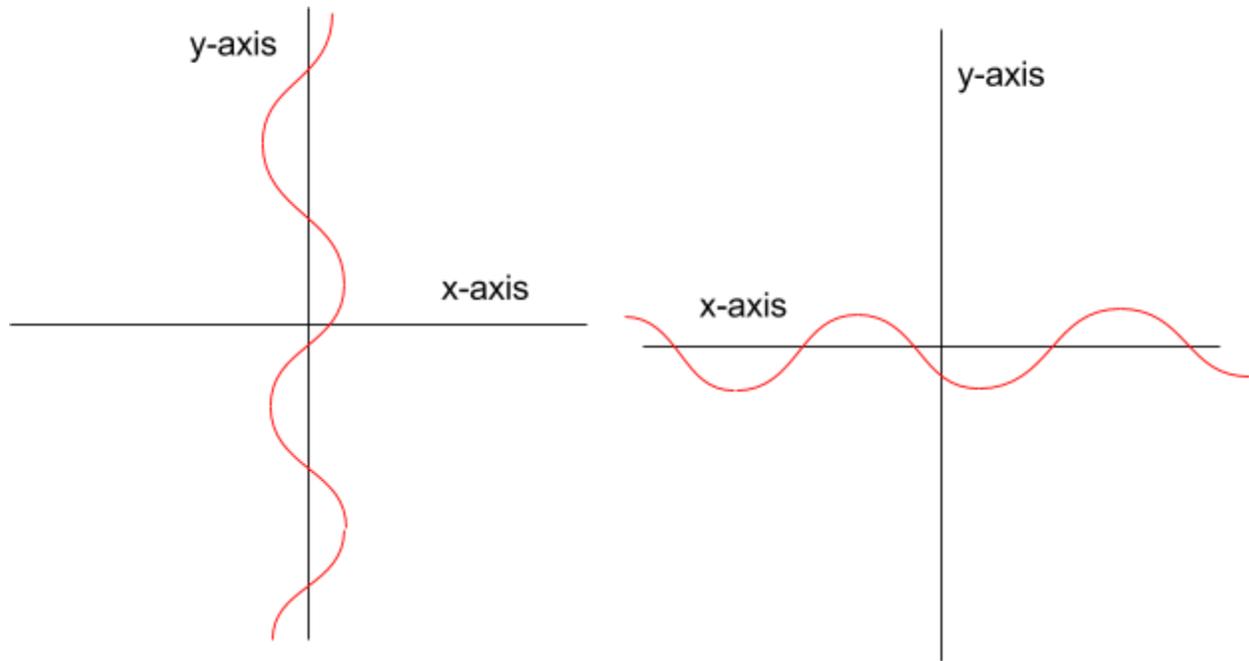


In the above example, light is diffracted through a small circular hole in an opaque surface. Light diffracts around all edges of the hole simultaneously resulting in a circular rainbow appearing around the fringes of the aperture. The effects of diffraction are increased as the size of the aperture decrease. The aperture of a camera operates in a similar fashion to the circular aperture described above, diffraction becomes more of an issue for a photographer as they decrease the aperture of their camera. The net result of this diffraction is a less sharp image when taken at an extremely small aperture than one taken at a moderate or wide open aperture.

Polarization: We have established that light particles (photons) move in a wavelike fashion.

The motion of those waves is not constrained to just one axis of movement. For example, a wave moving on the X axis will appear to be moving left to right horizontally, while a wave moving on the Y axis will appear to be rising and falling. A two-dimensional representation of movement

on the X and Y planes would appear as a line with no depth oscillating horizontally or vertically.

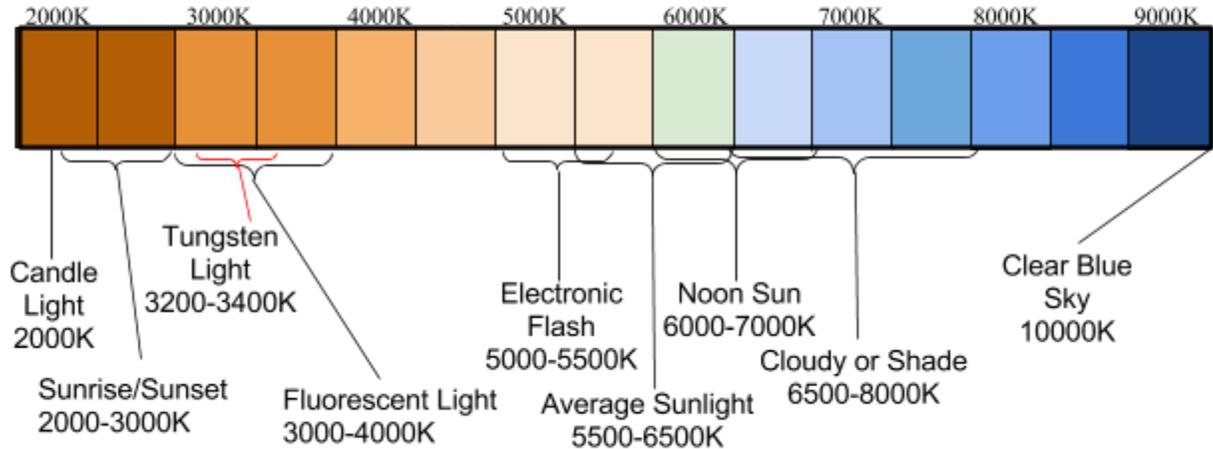


Wavelength movement is not restricted to movement on these two planes however. Waves may move on the X, Y and Z planes simultaneously. The resultant waveform of this type of movement would be a spiral, its diameter and circumference determined by the wave height. Polarization occurs when this light passes through a filter that restricts its movement to only one axis. For a photographer, polarization results in images that have significantly less glare. This can often mean that images taken with a polarizer filter can see through windows on a bright day, or through the surface of water without excess glare.

Define and Discuss Color Temperature

As discussed earlier, each color of light has its own unique wavelength. White light is made up of a combination of all colors simultaneously. Not every light source releases pure white light. An incandescent light bulb releases light that is more orange, while Light Emitting Diode (LED) lights typically release light that is more blue. We, as photographers and videographers, need a way to quantify the color of light that a source is radiating. From a practical perspective, we need a way to tell our cameras and video cameras what color is white.

Fortunately, scientists have given us a way to just that. The red/blue color of white light is described by a value known as Kelvin Temperature. This number is derived by looking at the natural color shifts that occur as you heat a black body. As it is heated, the black body shifts from black to red, then blue, and eventually white as more heat is applied. The Kelvin temperature that we use is a function of the heat that is applied to the black body. It is important to note that traditional color theory says that red colors are warm and blue derivatives are cool, when describing color Kelvin temperature, this is not the case. For Kelvin temperature, red colors have a lower value, while blue colors have a higher value.



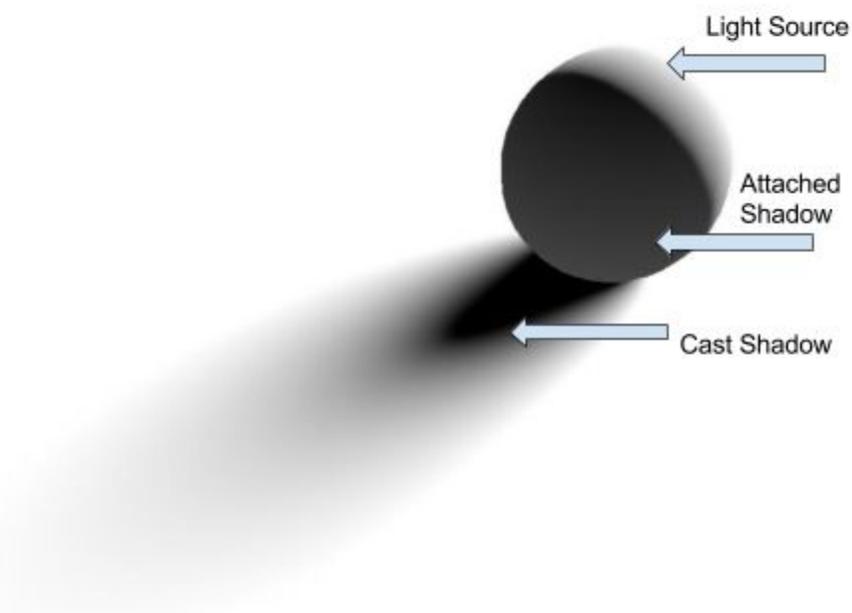
As a photographer or a videographer, we must know the color that each light source and how that impacts the image that you capture. Often times, you are going to encounter a situation where there are multiple light sources, each radiating at a different Kelvin temperature. This “mixed lighting” is a particular challenge and must be addressed by adding either orange or blue to the light sources to make them approximately the same Kelvin temperature. In order to effectively do this, we must be able to identify the type of light and correctly place it on the scale above to determine what color, and at what strength to add to balance that light source against any others.

Define and Attached and Cast Shadows

We have spent a significant amount of time discussing light, its properties, colors etcetera...

Light is only part of the equation when creating an image. The absence of light, or shadow, is what takes an image from being flat to containing volume. The contrast between light and shadow is instrumental in setting the mood or tone of an image.

Shadows can be defined as either attached or cast shadows. Attached shadows are always part of the actual object and will remain no matter how you move the object as long as the light source does not move. A good example of an attached shadow is a sphere where the side facing away from the light source remains in shadow. No matter how you move the object, there will be a shadow on the side that faces away from the light.



Cast shadows are created when light is blocked by an opaque surface and the shadow falls on a surface other than the object blocking the light. Cast shadows can be object connected, object disconnected or object independent. The image above is an example of an object connected shadow. Lifting the sphere off of the surface would detach the shadow from the object and create

an object disconnected shadow. In this scenario, the object casting the shadow is still within the field of view of the camera or camcorder. Removing the object casting the shadow from the field of view creates what is known as an object independent shadow (Zettl 22).

The position of the light in relation to the object being lit and the distance from that object to any other surface are going to be two of the important factors in determining the presence and quality of shadow.

Define and Discuss the Inverse Square Law

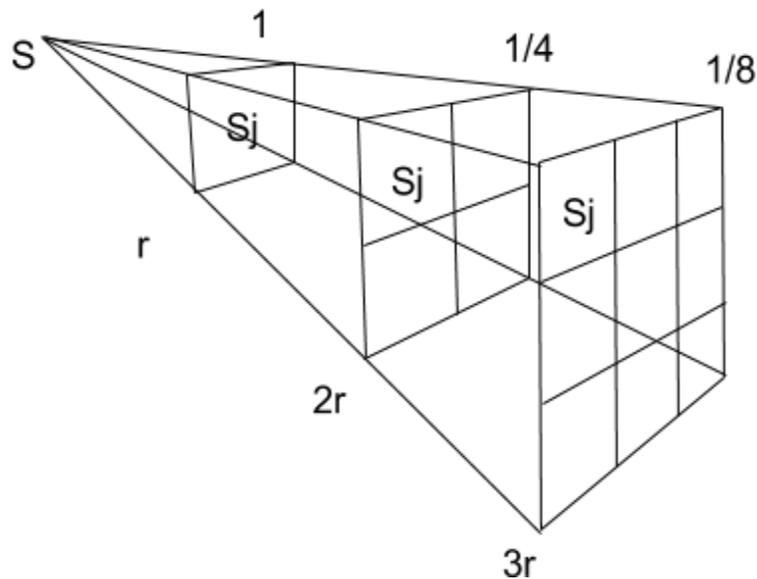
To this point, this discussion of the way that light interacts with objects after leaving its point of generation does not take into account the intensity of a light source. The presence or absence of light was sufficient for our earlier discussions, but now we will discuss the intensity of light and how that plays into our imagery.

Controlling the intensity of light that is emitted from a light source occurs in one of two ways. The first is by controlling the amount of power that is applied to the light. This method may not be the most practical because certain lighting instrument types, fluorescent lights for instance, cannot be dimmed. Other light sources, such as tungsten, experience radical shifts in color temperature as the power is either increased or decreased. These shifts often require the addition of gels to the light source to rebalance possible mixed lighting.

The most common way to control the intensity of light is to change the distance from the light source to the subject. You can experiment with this using a simple table lamp and a piece of paper. As you move the paper closer to the light, the light seems to reflect more brightly off of the paper. Likewise, as you move the paper further from the light source, the light reflects less light. The relationship between the distance between a light source and the intensity of the light it emits is described by The Inverse Square Law which states:

The intensity of illumination is inversely proportional to the square of the distance between the light and the subject.

In a practical sense, what does this mean for the photographer or videographer? Simply put, a light that is moved twice as far from the subject, only a quarter of the original light will be on the subject.



The diagram above shows that as the subject (Sj) moves away from the light source (s) the light diminishes by a factor of 2. As the subject moves from r to $2r$, or twice the distance from the source, the light diminishes to $\frac{1}{4}$ of its original strength. At $3r$ the light is only $\frac{1}{8}$ of its original strength. $4r$ would be $\frac{1}{16}$ the amount of light, $5r$ would be $\frac{1}{32}$ the amount of light and so on.

The diagram above also describes what happens to light intensity as the subject moves closer to a light source. If the subject moves from $2r$ to r , or twice as close, the light is going to be 4 times more intense. Likewise, if the subject moves from $3r$ to $2r$, the intensity change will be the same as moving from $2r$ to r . If the subject moves from $3r$ to r the light would be 8 times more intense than at $3r$.

The placement of lights has a direct impact on both the intensity of the light and the results that can be achieved with that light. A photographer can obtain many different feels and lighting ratios by just moving the position of one light. For instance, a 1:1 lighting ratio would mean two lights of the same intensity placed equidistant from the subject. A much more dramatic 8:1 lighting ratio can be simply achieved by moving one light from r to $3r$, or 3 times further away from the subject.

Define and Discuss Falloff

Both light and shadow have a tendency to fade in a gradual manner. This gradual change from light to shadow is known as falloff. There are two different, yet related relationships that we use this term to describe. First, the contrast in brightness between light and shadow. Secondly, the rate that the transition between light and shadow takes place. You can see this relationship at play all around.

When it comes to using falloff as a means to describe the contrast relationship between light and shadow, the term fast falloff means that the highlight area is very bright and the shadow is dark and rich (Zettl 25).. This is the type of falloff that is being played with in the ratio examples from the previous section. A lighting ration of 8:1 would lead to a dramatic contrast in highlight and shadow meaning a fast falloff. Likewise, a lighting ratio of 2:1 would mean far less contrast between highlight and shadow and therefore a slow falloff. A lighting ration of 1:1 would eliminate falloff because both the main and fill lights would be striking the subject at the same intensity. This is also known as flat lighting due to the absence of shadows that give the subject depth.

In its second usage, falloff describes the rate of change between light and shadow on a subject. Sharp and dramatic changes in contrast, such as the shadows from a sharp corner are exhibiting fast falloff. There is very little gradient, if any at all, in shadow when describing fast falloff.

Conversely, when shadows stretch around curved surfaces, the transition between light and dark is much more gradual. This gradual change is slow falloff in action. In this case, the slow falloff serves to give a sense of shape and volume to a curved surface.

Define and Discuss the Concept of Outer Orientation

The use and presence of light in a scene tells us a lot of information about that scene and how it relates to the world around us. Light can tell us the shape of an object, its texture, and its position in time (Zettl 26-30). Collectively, these are called outer orientation.

Not only can light tell us the overall shape of an object, it can tell us its position in space. That is one of the main functions of the Key or Main light (Zettl 26). The object's attached shadow gives the basics of the shape of the object whereas the cast shadows give a sense of place to the object in space. The way that a light source interacts with the different textural elements of a surface provide a lot of information about the composition of the surface. All of this information serves to provide contextual clues about the identity of the object and its position in space. Finally, we can infer a lot about the scene's place in time based upon the direction that the light is hitting an object within a scene.

Unknowingly, we can make many judgements about the time that a scene takes place based upon our experiences in the natural world. Simply put, day is bright and night is dark. The absence of shadows and harsh top lighting may indicate that a scene was photographed near midday. At midday, the sun is at its apex and thus does not produce much shadow. Earlier or later in the day, the sun is at increasingly extreme angles resulting in long shadows. We can use the length of shadows, much like a sundial, to have a clue about when a scene was shot. Also, we can use color temperature and light intensity to seasonally place a scene. Outdoor light in winter is typically less intense and trends towards a slightly higher Kelvin temperature than the warm summer sun.

Define and Discuss the Concept of Inner Orientation

While light tells us a lot about the physical structure of a scene, it does something else. Light and shadow convey a sense of mood and atmosphere. This internal feeling is referred to as Inner Orientation. Something as simple as the amount of light that is present in a scene can create a broad range of emotions in the viewers. For instance, High-Key lighting, where the scene is illuminated in a way to reduce contrast, exudes a feeling of hope or airiness.

High-Key lighting

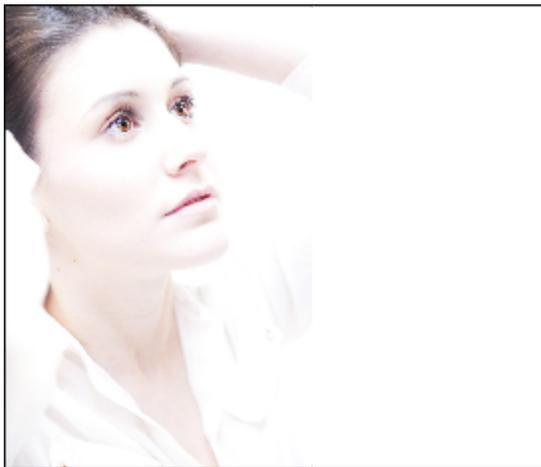


Photo by Camilla Rose Henley

Low-Key lighting



Photo by Gürkan Sengün

On the other hand, Low-Key lighting places emphasis on high contrast and a low level of background light. The highlights are directional and very specifically placed. Low-Key lighting is typically used to light spaces where there is little expectation of light, such as caves, submarines and night (Zettl 30). Whereas High-Key lighting is light and hopeful, Low-Key lighting leads to a feeling of drama and foreboding.

While the amount of light can go a long way in setting the overall mood of a scene, the position of the light source in relation to the subject also contributes to the inner orientation of a scene. Remember the cliché campfire trick of holding a flashlight below your chin to make you look foreboding when telling a scary story? This is an excellent example of using the position of the

main light source in a Low-Key lit environment to change the audience's inner orientation from normalcy to tense drama.

When a subject that is lit from above their eye-level, the shadows on their face fall in a way that we as viewers are used to and the scene is interpreted as normal.(Zettl 31). Moving the main light below the eye level of the subject inverts the way that the shadows fall on the face creating a subject that is dark, foreboding and possibly scary. Just like the person telling the scary story around the campfire.

Light can also be used to heighten the drama or intensity of a scene by moving around or showing the light source itself. In a video, the scene may move from High-Key to Low-Key lighting when moving from one location to another. This may also be used as a trick to change the feel or the mood of the moment from one of hope to an ominous moment. Likewise, the position of the main light may move depending on the mood that is intended. Having a light move from above eye level to below eye level may portend that the subject is undergoing a change from good to evil for instance. Showing the light source that is illuminating the subject may also serve to set the scene. For example, in a scene where the subject is standing next to a road at night would make sense to have the subject lit by the headlamps of an oncoming car. Showing the lights that are used to illuminate the subject also serves to set the scene.

Define and Discuss Triangle (3 Point) Lighting

To this point, we have spent a significant amount of time describing theory. Now it is time to discuss how we, as photographers and videographers, can put this theoretical knowledge into practical use. Triangle or 3 Point lighting is the most common lighting setup that photographers and videographers use in both studio photography and videography. To understand how this lighting works, it is first important to understand the components of this setup. First, as the name implies, there are three lights that are used to accomplish 3 Point Lighting. They are:

Main Light: As its name would imply, the Main Light is the primary source of illumination for your subject. This light is what is going to determine the overall exposure level and the intensity of the other lights in the scene. The Main Light may be positioned on either side of the subject and may illuminate the side of the face turned towards or away from the camera, broadside and short side lighting respectively (London 391).

Fill Light: The Fill Light works in conjunction with the Main Light to soften, or fill in, the shadows created by the Main Light. These shadows define the depth of the subject and the intensity, or darkness, of these shadows is controlled by the intensity of the Fill Light. The Fill Light is the light that is going to determine the lighting ratio 1:1, 2:1 4:1 etc... of a scene. Traditionally, the Fill Light is placed opposite the Main Light and strikes the subject at approximately the same angle as the Main Light.

Backlight/Hair Light: Now that the front of the subject is illuminated, it is time to pay attention to how the subject interacts with the background of the scene. The Backlight or Hair Light provides a sense of separation between the subject and the background. Essentially, a Backlight creates a small rim of light on the fill side of the subject to prevent the subject from disappearing into the background.

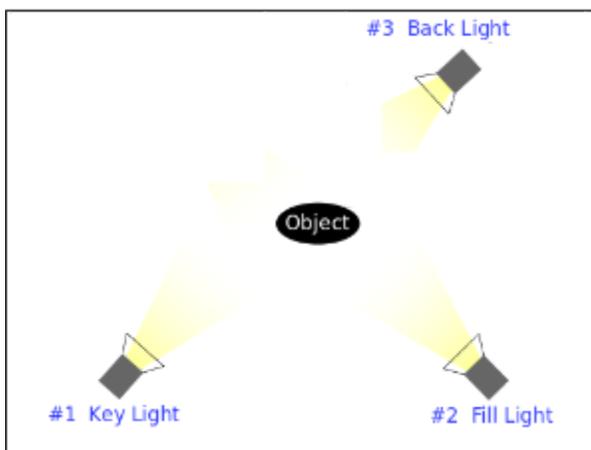


Photo by James Jeffery

The diagram above shows a basic 3 point lighting setup as well as the results that such a setup would yield. This lighting setup does a good job of lighting a subject independent of their background. Sometimes, however, it is necessary to show what is directly behind the subject. In this case, standard 3 Point Lighting becomes 4 Point Lighting by the addition of a background light.

3 Point Lighting is often the first form of lighting that is taught because it will typically deliver a useable product in a wide variety of situations. Keep in mind, 3 Point Lighting is a basic form of lighting. It suitable for delivering a well lit interview or studio portrait, but may not deliver the desired aesthetic if a more dramatic or emotional look are desired.

Define and Discuss Chiaroscuro Lighting

Often times the photographer or videographer will want to use the contrast between light and dark to add drama or emotion to their imagery. They may also want to show or clarify the volume of the image to make it appear more three dimensional in nature. This is the role of Chiaroscuro (kee-aura-skoor-o) lighting. This lighting can be quickly identified in photographs and videos by looking at the relationship between highlights and shadows. Chiaroscuro lighting features highly directional lighting that highlights certain intentional aspects of the scene coupled with fast falloff shadows.



The Matchmaker Gerard van Honthorst (1590–1656)

The painting above illustrates key aspects of Chiaroscuro lighting. The light emanating from the candle on the table illuminates the subject of the painting while the falloff from that light provides definition to the other characters around the table. Honthorst clearly wants to draw the viewer's attention to the face and front of the subject while allowing other supplementary details to be lost in shadow.

In a more academic sense, lighting should still perform at least some of these aesthetic functions: organic, directional, spatial or compositional, thematic or emotional (Zettl 40).

Organic: Light that is added to a scene should look as though it has a purpose for being there. Take the Honthorst painting above for instance, it would seem out of place for the artist to illuminate the scene from above when there is clearly a burning candle on the table. The same holds true when photographers and videographers light scenes. If a subject is sitting near a window during daytime, illuminate them on the side that the window is on.

Directional: Light can be used to highlight portions of the image that the photographer or videographer wish to highlight. This is used to take the viewer on a visual journey through the image and detail important items. In the painting above, the

Spatial: Light areas and dark areas of a frame should be spaced out in such a way as to allow for a sense of balance to be present within the scene. Images that are too skewed light or dark may not have visual interest, or worse may distract from the message that the shooter is intending to convey.

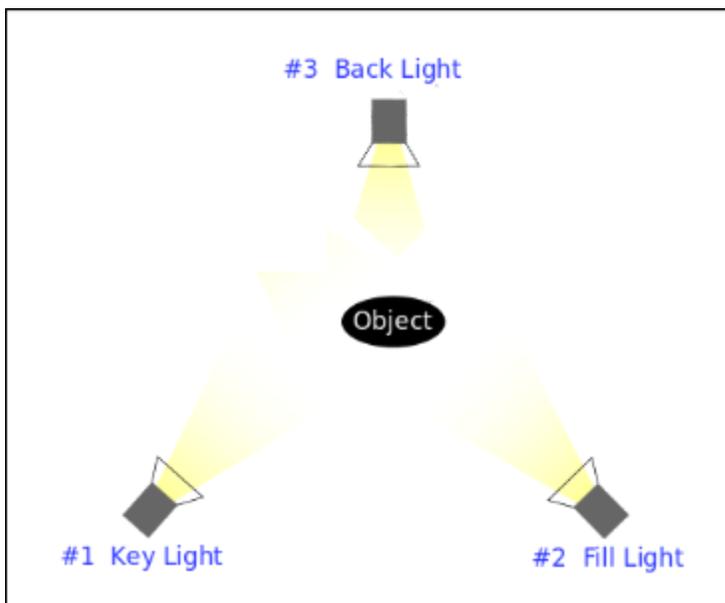
Thematic: The way that a scene is lit should serve to help in telling the story that the photographer or videographer wishes to tell. If the overarching theme of the piece is death for instance, the photographer should emphasise the shadows of the scene. Likewise, if the scene is about birth or life, High-Key lighting may be in order.

Emotional: Emotional and Thematic functions are closely tied with one another. The emotional function of light is to impact our feelings regardless of subject matter (Zettl 42).

Define and Discuss Flat Lighting

Flat Lighting is the exact opposite of Chiaroscuro Lighting. Instead of creating dramatic interplays between highlight and shadow, the function of Flat Lighting is to eliminate shadow. Typically, Flat Lighting does not have an obvious light source. Light wraps around the subject casting translucent and almost invisible attached and cast shadows. In short, nothing is lost in shadow because shadows are not present in the scene.

Achieving flat lighting in a scene is a simple matter of first placing Main and Fill lights equidistant from the subject. They should be facing the subject at approximately the same angle. Secondly, Flat Lighting is achieved by broadly diffusing the light to further eliminate shadows.



President Barack Obama's transition portrait is a good example of flat lighting. His face is evenly illuminated with a very slight falloff of light between his nose and ears. In this instance, much like the studio portraits that we take on a daily basis, there is a light placed to illuminate the flag and the background.

Define and Discuss Silhouette Lighting

Unlike the lighting techniques that we have discussed to this point Silhouette Lighting emphasises contour over volume or texture (Zettl 46). Silhouette Lighting has elements of both Chiaroscuro and Flat Lighting, but it is different enough to be considered a separate type of lighting. Like Chiaroscuro Lighting, Silhouette Lighting exhibits extreme contrast between highlight and shadow, but it also Flat because of its emphasis on contour. Silhouettes can easily be identified by their light background with a subject represented by dark shadow.

The key to effective Silhouette lighting is lighting and exposing for the background of the image. The subject that will be the silhouette is placed between the light source (background) and the camera. The photographer then exposes for the extremely bright background thus rendering the darker subject as a complete shadow (the light is hitting the side of the subject away from the camera).



While the photograph above is an effective silhouette, it also demonstrates that a silhouette is not a studio-exclusive phenomenon. They can occur whenever and wherever a bright light source is behind the subject. As stated earlier, to achieve the silhouette, the photographer must expose for the light source and not the subject.

Define and Discuss Front Lighting

As its name would imply, front lighting is illuminating a subject by a single light placed directly in front of the subject. The light source is placed as close to the axis of the lens as possible to

reduce the distance that shadows extend from the object that cast it. This lighting is traditionally very flat in nature because the subject is looking directly into the light thus light is cast on both sides of their face evenly. It also serves to minimize texture because no light is hitting the subject from the side. Falloff from light to shadow will depend on the size of the light source and the extent that it is diffused.



Unless the photographer uses an lighting implement such as a ring flash, the camera and the light source will be off axis from one another slightly. Photographers need to be conscious of the possibility of red-eye when using a flash light source that is on axis with the lens of the camera.

Define and Discuss Side Lighting

Moving the Main light from directly in front of the subject to the side of the subject can affect a large change in the mood of the resulting image. Side Lighting serves to emphasise facial features and textures, such as that of skin (London 240). Typically the light is placed at subject level and directly to the side of the subject. The light may be hard or soft depending on the intensity and falloff speed of shadows desired. If a subject is facing the camera, side lighting will appear as though the subject has a line demarking light from shadow down the center of their face.

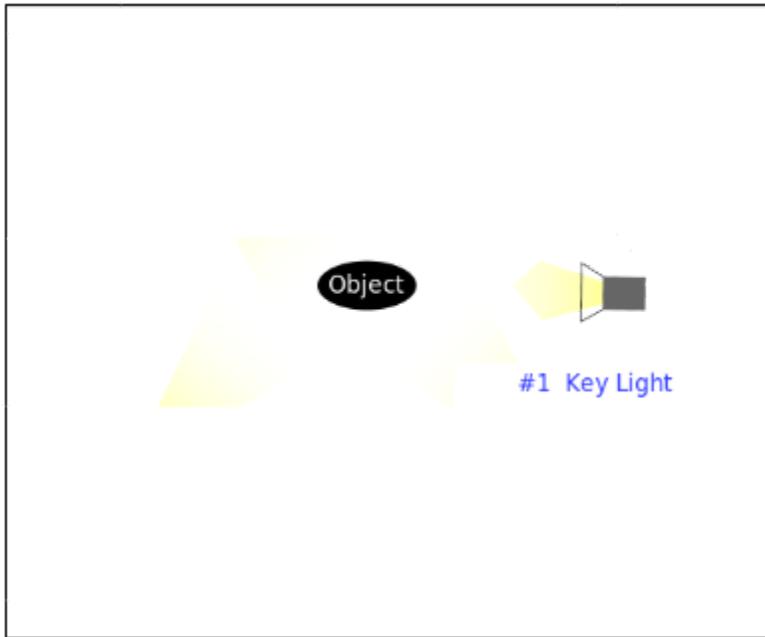


Photo by Hari Bhagirath

The above self portrait by Hari Bhagirath also illustrates a common scenario in which side lighting is used, the window portrait. Sitting a subject next to a window makes for a quick side lit portrait setup with no lighting equipment required. Light shining through the glass of a window will be softer than undiffused daylight. A portrait such as this can play with the internal orientation of the image and make it read more dramatic.

Another quick and effective use of side lighting for portraiture is the High Side Light. This modification of Side Lighting takes the Main Light and moves it 45 degrees from the side of the subject and 45 degrees down on the subject. The resulting photo mimics the lighting that we see in natural daylight and does a great job at rendering the face in three dimensions as well as being flattering for the subject (London 230).

Define and Discuss Backlighting

The initial setup for a Backlit shot is essentially the same as for a silhouette the exception being that the light produces a rim or halo or light around the subject. As there is no light shining on

the face of the subject, the face will fall off into shadow as will the background. Special care must be taken to ensure that the light and its stand are not visible in the image. Using a Backlight on its own is a specialty portrait that we will rarely use. Backlighting is often used in other lighting styles to separate a subject from a background.

Define and Discuss Existing Light

Every one of the lighting styles mentioned above can be achieved using a variety of lighting instruments. While we focused on each of these lighting techniques in a studio environment, each can be accomplished using nothing but the light that exists in the scene. Photographers and videographers cannot overlook the brightest light on Earth when making their images, the Sun. By moving your subject in relation to the position of the Sun, you can move from one lighting technique to another. The time of the day, the time of the year, clouds and the presence or absence of trees are all things that can affect the quantity and quality of existing light.

Even sunlight can be modified to fit the needs of the photographer. Silks can diffuse sunlight resulting in a nice highly diffused light. Reflectors and bounce cards can reflect light from the sun and take the place of the Fill Light to enable multi-point lighting when outdoors. In short, the type of lighting that can be achieved is only limited by the photographer's imagination and their tools on hand.

Existing light is not limited to light created by the Sun. Anything that creates a light in a scene that is there naturally is existing light. For instance, a candle, a fireplace, light streaming through a window are all sources of existing light.

Define and Fluorescent Lighting

Through the course of our job, one of the most common lighting scenarios that we will encounter on a day-to-day basis is lighting for fluorescent lights, i.e. in an office space. Fluorescent lights are gas lamps that contain mercury vapors that create light when electricity is passed through

them (Lynch-Johnt 43). The light that is emitted by these lamps typically has a green hue that can be difficult to balance when using other light sources. There are multiple solutions to dealing with the green cast by fluorescent lights. If possible, i.e. when lighting by other means, turn off the fluorescent light source. If that is not possible and the fluorescent light source is the only available light, most cameras have a built in white balance setting to correct the green cast. If you are in a mixed-lighting scenario involving fluorescent lighting, a magenta filter for the camera, or green gels can be used on external strobes to white balance the image.

Recent years have seen a shift from traditional fluorescent bulbs to daylight balanced bulbs. These lights are balanced to emit light at approximately 5400K. If these bulbs are present, the scene can be shot as though in outdoor sunlight. A good rule of thumb when shooting indoors is to look at the lights that are present, take a test shot and white balance from there. In tricky lighting situations, such as a mixture of daylight balanced and traditional fluorescent bulbs, setting manual white balance on your camera with the aid of a white card may yield the best white balance and consequent color rendition.

Discuss the Following Factors that Affect Exposure when Using Flash

Managing exposure when illuminating a scene with flash strobes, either studio or portable units, changes the way in which a photographer must control their exposure. Each of the traditional exposure controls, shutter speed, aperture and sensitivity (ISO) has a significant impact on how the light from a flash is rendered in the subsequent image. For most images, the end goal of using flash is to make it as inconspicuous as possible. Flash should compliment the scene, not dominate it. The key to achieving this goal is mastering how exposure controls affect the light from the flash.

Shutter Speed: Traditionally, shutter speed is a method for controlling the amount of motion that is present in an image. Slower shutter speeds leads to more motion blur in an image. Flash however, tends to freeze the action at the moment that the strobe was triggered. Shutter speed

does have an important role to play though. It controls the amount of background light that is present in the image. High shutter speeds will result in little, if any, ambient light. Slow shutter speeds allows more of the natural light in the scene to bleed through into the image. This delicate balance between flash power and ambient light is what allows the photographer to blend flash into their final image

Aperture: If shutter speed controls the amount of background light in an image, aperture controls the amount of flash that is in an image. The larger the aperture, the more light from the flash is allowed to hit the sensor.

Sensitivity: The sensitivity of the sensor (ISO) will raise or lower the effects of both shutter speed and aperture simultaneously. Just like adjusting ISO without flash, adjusting this value has the potential for introducing unwanted grain into the image.

Distance: Flash, just like any other light source is beholden to the Inverse Square Law. As discussed earlier, moving the light source either towards or away from the subject will result in an increase or decrease of light by a factor of 2. For example, moving a flash twice as far from a subject will result in only $\frac{1}{4}$ of the original light striking the subject. Moving that same light back the same distance again will result in $\frac{1}{8}$ of the total light striking the subject. That same formula holds true when moving the light closer to the subject. In short, changing the distance between the flash and the subject changes the intensity of the flash on the subject.

Flash Compensation: Every light modifier that is applied to a flash will impact the amount of light that eventually reaches the subject. You may hear some photographers talk about how using a diffuser costs them x-stops of light. Flash compensation is a quick way to account for this. Most modern flashes will allow the photographer to quickly adjust +/- 3 stops from the flash unit itself. This allows the photographer to not worry about adjusting the aperture (affecting the image depth of field) to increase the power of the flash. This is also extremely helpful for making flash power adjustments when in flash modes other than manual.

Discuss Flash Synchronization Speed

Earlier, when discussing the theory and properties of light, we discussed the speed of light. In terms of flash photography, light travels from the flash to the subject and from the subject to the sensor of the camera nearly instantaneously. Unfortunately, the shutter mechanisms of modern cameras are nowhere near that fast. The focal plane shutters in DSLR cameras operate by having two black curtains that pass over the sensor to expose the sensor to light coming in through the lens. These curtains move at slightly different times producing a gap across the sensor as they move. The time delay, and thus the size of the gap is what determines the “shutter speed” of the camera. For example, a shutter speed of $\frac{1}{2}$ of a second would result in a gap being big enough to be easily seen by the naked eye. Conversely, a shutter speed of $\frac{1}{8000}$ of a second would only present as an extremely small slit that passes over the sensor.

When taking a photo using flash, if the shutter speed is set to higher than $\frac{1}{200}$ of a second for Canon cameras and $\frac{1}{250}$ of a second for Nikon cameras the light from the flash will enter the lens and strike the shutter instead of the sensor. When this happens you will notice a thick black horizontal band on your image obscuring part, or most of your image depending on the shutter speed of the camera.

Modern DSLR cameras and flash units have electronic controls that minimize the chance that this will happen. This is known as the synchronization or sync speed. When a flash unit is attached to the camera and turned on, the camera will limit the maximum shutter speed to avoid the shutter being present in the image.

There are some times when a photographer may want to use flash at a shutter speed higher than $\frac{1}{200}$ second for Canon and $\frac{1}{250}$ second for Nikon. If this the case, most modern on-camera

flash units have a setting called high speed sync. With this setting enabled, the flash will emit a series of pulses to illuminate the entire frame of an image up to 1/8000 of a second.

Discuss the Following Flash Modes

TTL: TTL or Through the Lens is an automatic flash control that uses the light passing through the lens of the camera to turn off the flash when the camera records a correct exposure (Lynch-Johnt 122). As a rule, TTL flash modes will only work with direct flash and only with the flash head locked in the down position.

Automatic: Automatic flash is a setting where the camera measures the light that is falling on the scene and automatically fires the flash in low light scenarios (Lynch-Johnt 11).

Manual: As its name implies, Manual flash is a mode where the photographer takes complete control over the the flash unit. This mode allows the most aesthetic control but requires the photographer to know how to manipulate the camera's exposure controls.

Slow Sync: As discussed earlier, shutter speed controls the amount of ambient light in a scene. Sometimes photographers want to emphasize motion while using flash. Slow sync flash couples slow shutter speed to emphasise motion while using flash to freeze action and retain detail.



As the image above demonstrates, the result of slow sync flash will be items frozen in place with trails and streaks denoting their motion.

Rear Curtain: The focal plane shutters of modern DSLR cameras operate with two curtains that pass over the sensor to expose the sensor to light. When using a flash, the photographer has an

option of when during the exposure to trigger the flash. This is known as either front curtain sync or rear curtain sync. Front curtain sync means that the flash is fired as the first curtain reveals the sensor. The result of this is light trails that in front of the subject frozen by the flash. In most instances, this can be a jarring visual effect. Rear curtain sync fires the flash just before the second curtain covers up the sensor ending the exposure. The resultant image has motion trails that extend behind the subject. This typically appears more natural and less jarring than front curtain sync.

Fill Flash: Fill flash is the use of artificial light to supplement ambient light and add light to shadows when subjects are backlit, in shadow or illuminated by high-contrast lighting (Lynch-Johnt 40). In extreme cases, fill flash can be used to match the apparent intensity of the sun in a backlit scene thus rendering a natural looking exposure. This technique used to be referred to as synchro-sun flash.

Red Eye Reduction: When a flash is attached to a camera and is positioned close to the axis of the lens, the resultant image may exhibit what is known as red eye. This is as a result of light from the flash bouncing off of the subject's retina and back into the camera. The simplest solution for reducing or eliminating red eye is to remove the flash from the axis of the lens. Some cameras and flash units have a built-in red eye reduction feature which shines a brief burst of light at the subject before the image is exposed. This serves to contract the subject's pupils and reduce the window that light has to enter the eye and cause red eye.

Discuss the Following Flash Techniques

Flash units are a portable light source and are capable of far more than emitting a simple one location harsh light. A single flash unit is capable of mimicking most light sources that a photographer can find in nature. Learning both how to use the flash unit and modify the light that it creates can take an ordinary photograph and make it stand out, tell a story or evoke an emotional response.

Off Camera: Moving the flash from its hot shoe is one of the easiest things that a photographer can do to drastically change the resultant image. If the flash is left attached to the camera, the photographer is mostly limited to shooting their subject frontlit. Moving the flash unit allows a photographer to go from a frontlit portrait to sidelit, high-side lit, or even a back lit portrait. Some of the most famous portraits were lit using only a single light source. Very few were taken with a flash attached to the photographer's camera.

There are multiple ways to get the flash to function apart from the camera. The most common ways that a modern photographer will have experience is by using either a sync cable, or on newer camera systems a wireless sync system. Wireless sync systems may be controlled by a variety of means such as radio frequency (RF), Photonic (triggered by light) or infrared (IR). The type of wireless syncing that you can use will depend greatly on the capabilities of your gear and the distance that you need the flash to work from the camera.

Off Camera Using Multiple Synchronization: Modern camera systems have the ability to control multiple portable flash units simultaneously. This gives the photographer the ability to establish main, fill, hair and background lights if they so choose. Essentially, a photographer can have an entire studio light setup that can fit into their camera bag. Additionally, current flash offerings have the ability to be divided into multiple shooting groups allowing photographers to control in excess of 100 portable flash units at a time. Flashes can be grouped together and fired simultaneously so that they can mimic much larger studio strobes. Finally, modern flash systems allow the photographer to change the settings on each group of flashes from the master unit attached to the camera, thus giving the photographer quick and easy control over their flash units.

Bounce: In section 102.4.3 we discussed how light can reflect off of a surface. Essentially a photographer can use this reflectance to their advantage when using a light source. Light is emitted from a flash unit, hits a surface and is then directed onto the subject. This allows

photographers to drastically change the direction that their light hits their subject with minimal effort.

While bouncing light is a tool in the photographer's bag, light being bounced is still beholden to the properties and behaviors of light that were discussed earlier. For instance, the texture of the surface may diffuse, or scatter, the light that strikes it both softening and reducing the total light that reaches the subject. The surface may absorb or transmit certain wavelengths of light resulting in a color shift in the light that reaches the subject.

Finally, light that is bounced is still subject to the Inverse Square Law. Photographers must take into account the distance from the flash to the object that the light is bouncing from as well as the distance between the bounce object and the subject when determining the amount of power to apply to the flash. The photographer will only be able to use either automatic or manual modes when bouncing light.

Diffuser: When discussing reflection in section 102.4.3 we talked about how light reflects off of a surface at the same angle that it hits that surface. When a focused beam of light hits a material that scatters light, it is diffused. A diffuser is a material that scatters and softens light. This diffused light creates a slow falloff in shadows and causes light to “wrap” around objects. Any object that softens light can act as a diffuser, but some of the most common are diffusion cloth, cheese cloth, and frosted plastic. Photographers must remember that diffused light, just like bounced light will lose its intensity and must be compensated for.

Direct: Direct flash is directly as its name would imply, flash pointed directly at the subject. Direct flash only deals with the direction that the light hits the subject, not the quality of light i.e. either diffused or undiffused.

Painting With Light: Painting with light is a photographic technique where a photographer exposes a long shutter speed image while physically and intentionally moving a light source through the frame.



The images that can be created by a photographer painting with light are only limited by the photographer's imagination and the light sources that the photographer has access to. As the image above demonstrates, painting with light does not have to be accomplished with traditional lighting instruments, anything that generates light can be used.

Photography

The discussions of light and color theory earlier in this guide have been setting the groundwork for the practical application of this knowledge. Photography is one of the many skillsets the Sailors with NOS B610 are expected to be able to accomplish both skillfully and artfully.

Photography is the process of producing images by the reaction of radiant energy, particularly light on a sensitive surface (Websters). Traditionally this has been accomplished through the use of a camera which focuses light on a photographic emulsion, or light sensitive film. Throughout the history of photography, different emulsions, formats and processes were used to accomplish this imagery. 2003 marked a major shift in the field of photography as it was the first time that digital cameras outsold their film counterparts.

Digital cameras, which have become the standard within the Department of Defense, will be the primary photographic tool that you will use. Regardless of the capturing technique, either film or digital, the principles behind the operation of a camera have remained constant. Understanding these principles, the photographer will be able to understand how their camera works, and how to best use it to capture images.

Discuss exposure and how it relates to the following:

To understand exposure, and the variables that constitute it, you have to have a basic understanding of how a camera functions. To produce an image, a camera directs and focuses light from a scene onto a photoreactive emulsion, or in the case of modern digital cameras, the sensor. Lenses manipulate the light creating an image that passes through the aperture, or small opening, to focus that image on the sensor. The shutter controls the time that the sensor is exposed to the light. This works in conjunction with the sensitivity of the sensor to impact the overall image.

Aperture: After light enters the lens the first element that controls exposure that the light encounters is the aperture. In its simplest terms, the aperture of a lens is a restrictive opening that varies in size to regulate the amount of light that passes through to the sensor. Aperture is assigned a value that is referred to as an f stop. Large f stop values refer to a small opening in the aperture whereas a small f stop number represents a large opening of the aperture. So f1.4 will allow significantly more light to reach the sensor than an aperture of f22.



For aperture size to be of photographic use in calculating exposure, there needs to be a way to determine the amount of light that is striking the sensor and how changing the size of the aperture affects that light. Fortunately, our lenses are typically marked in single stop increments. What this means is that moving one stop down the scale from f2.8 to f4 would result in a reduction of half the amount of light hitting the sensor.

Shutter Speed:

Sensitivity:

Discuss the following metering techniques:

Spot:

Center-weighted:

Average:

Partial:

Discuss how the following may affect image quality:

ISO:

Resolution:

Compression:

Discuss camera color settings

Discuss auto and manual focus

Discuss zoom lenses

Discuss prime lenses

Discuss how lenses affect the following:

Focal length and image size:

Focal length and subject coverage:

Angle of field:

Angle of view:

Compression:

Depth of Field:

Foreground/Background:

Discuss shooting with natural light in the following conditions:

Daylight:

Low Light:

Night Time:

Discuss the fundamentals of composition

Rule of thirds:

Balance:

Leading Lines:

Symmetry:

Patterns:

Viewpoint:

Background:

Foreground:

Depth of Field:

Framing:

Contrast:

Discuss the importance of each of the following:

Control your background:

Fill your frame:

Wait for moments:

Discuss and discuss the use of histograms

Discuss studio requirements for the following:

Navy special programs packages:

Officer full lengths:

Roster board/Biography studio portraits:

Passports:

ISOPREP:

Discuss studio setup and layout

102.7.15 Discuss the following components of a caption

VIRIN/Vision ID:

5Ws and H:

Dateline:

Credit line:

Discuss the following components of IPTC metadata

Caption:

Keywords:

Release Authority:

Classification:

**Discuss and discuss the photography categories represented in the Navy
Media Awards program.**

Communication Law and Ethics

Ethics

All DON PA/VI professionals are members of the organizational function that communicates for the department. This is true regardless of whether they are in a billet with the duty to release information directly to the public or the media. It also applies when they are not in uniform and not “on the job.”

Statements made about military and political issues, including those expressed on personal social media accounts, will be perceived as the official views of the government. This may undermine the credibility of the DON and the effectiveness of the individual to serve as a communicator for the department. While this does not abridge their individual rights under the First Amendment, DON PA/VI personnel must maintain their value to the organization by observing a higher standard of discretion than typically expected of federal civilian employees and military personnel.

DON PA/VI personnel must strive to remain aloof and even disinterested in the development of social, political and cultural issues. We are never NOT representatives of the department.

Navy Public Affairs Canon of Ethics

Ethics are the rules or standards governing the conduct of a person, organization, or the members of a profession. The Department of the Navy holds itself to a high ethical standard with the DON Core Values of Honor, Courage and Commitment. To earn and maintain the trust and credibility essential to properly represent the DON, all military and civilian personnel in the public affairs (PA) and visual information (VI) fields shall be:

Loyal. Act in the best interests of the nation, the DON and the command, and drive the fulfillment of the obligation to inform U.S. citizens about their Navy and Marine Corps. Loyalty must be to the institution first.

Honest. Ensure all information for release is accurate, truthful, timely, and presented in its proper context.

Trustworthy. Fulfill the obligations accompanying unique access to information about operations, organizations, programs and people by being committed to requirements for security, privacy and propriety.

Honorable. Maintain the integrity of relationships with contacts in the government, the media, and the public.

Courageous. Always be ready and willing, even in the face of opposition, to provide the principled, candid advice and counsel that must be asserted to aid commanders and other leaders in making decisions.

Fair. Receive all requests for information and support with respect, treating each equitably and expeditiously while preserving the integrity of DON communication.

Photojournalism Ethics

Still image and video post-production enhancement and alteration are the main photojournalism ethics issues. Enclosure 10 of Department of [Defense Instruction 5040.02](#) (Visual Information) is the governing regulation for VI ethics.

The alteration of official DoD imagery by persons acting for or on behalf of the DoD is prohibited. Prohibited alterations include the addition, removal, or changing of photographic details. Examples of prohibited alteration include the addition, changing, or removing of individuals, equipment, scenery, or the unrealistic changing of color or light. Certain modifications or enhancements to official DoD imagery are permitted but must be disclosed in the caption data so that the image does not mislead or deceive.

Photographic techniques common to traditional darkrooms and digital imaging stations (dodging, burning, color balancing, spotting and contrast adjustment) used to achieve the accurate recording of an event or object are not considered alterations.

Photographic and video enhancement, exploitation and simulation techniques used in support of unique cartography, topography, engineering, geodesy, intelligence, criminal investigation, medical research, development, test and evaluation, scientific and training requirements are authorized if they do not misrepresent the subject of the original image.

The obvious masking of portions of a photographic image in support of specific security, criminal investigation, privacy or legal requirements is authorized.

Mass Communication Law

A general understanding of certain aspects of Mass Communication Law is important for Navy MCs. Even though the work MCs produce for the Navy is the property of the U.S. government, understanding the importance of the First Amendment, knowing the law regarding defamation and copyright and understanding privacy rights are essential to performing the job of an MC properly.

First Amendment

The First Amendment to the U.S. Constitution guarantees the Freedom of the Press. This guarantee forms a baseline for the U.S. Military's obligation to communicate with the American public. DoD Joint Publication 3-61 Public Affairs states:

“The US military has an obligation to communicate with the American public, and it is in the national interest to communicate with the international public. Through the responsive release of accurate information and imagery to domestic and international audiences, public affairs (PA) puts operational actions in context, facilitates the development of informed perceptions about military operations, helps undermine adversarial propaganda efforts, and contributes to the achievement of national, strategic, and operational objectives.”

Defamation: Slander and Libel

According to the Digital Media Law Project (<http://www.dmlp.org/legal-guide/what-defamatory-statement>), defamation is “a false statement of fact that exposes a person to hatred, ridicule, or contempt, causes him to be shunned, or injures him in his business or trade. Statements that are merely offensive are not defamatory.”

Defamation is called slander when spoken and is called libel when printed, published or broadcast. Because of the greater potential damage libel could cause to reputation, is it generally considered the greater offense.

No Federal Law governs defamation. Libel and slander laws are made at the State level and can vary some from state to state. According to the Associated Press Stylebook, there are generally five things required for someone to successfully prove libel:

1. A defamatory statement was made.
2. The defamatory statement is a matter of fact, not opinion.
3. The defamatory statement is false.
4. The defamatory statement is about ("of and concerning") the plaintiff.
5. The defamatory statement was published with the requisite degree of "fault."

The Freedom of Information Act

The Freedom of Information Act (FOIA) provides any person the right to obtain access to federal agency records, except records or portions of records that are protected from public disclosure by one of nine exemptions or by one of three special law enforcement record exclusions. A FOIA request can be made for any agency record. The Freedom of Information Act was enacted on July 4, 1966 and took effect one year later. (Source: <http://www.foia.gov/about.html>)

Any “person” can file a FOIA request, including U.S. citizens, foreign nationals, organizations, universities, businesses, and state and local governments. As an exception, DoD components that are part of the intelligence community are precluded from releasing records responsive to requests made by any foreign government or international government organization. (Source: <http://www.dod.mil/pubs/foi/docs/FOIAhandbook.pdf>)

Three Exclusions

Congress has provided special protection in the FOIA for three narrow categories of law enforcement and national security records. The provisions protecting those records are known as “exclusions.”

The first exclusion protects the existence of an ongoing criminal law enforcement investigation when the subject of the investigation is unaware that it is pending and disclosure could reasonably be expected to interfere with enforcement proceedings.

The second exclusion is limited to criminal law enforcement agencies and protects the existence of informant records when the informant's status has not been officially confirmed.

The third exclusion is limited to the Federal Bureau of Investigation and protects the existence of foreign intelligence or counterintelligence, or international terrorism records when the existence of such records is classified.

(Source: <http://www.foia.gov/faq.html#exclusions>)

Nine Exemptions

Records, or portions of records, will be disclosed unless that disclosure harms an interest protected by a FOIA exemption listed in 5 U.S.C. § 552. The nine FOIA exemptions are:

1. Classified national defense and foreign relations information.
2. Internal agency personnel rules and practices.
3. Information that is prohibited from disclosure by another federal law.
4. Trade secrets and commercial or financial information obtained from a person that is privileged or confidential.
5. Inter-agency or intra-agency memoranda or letters that are protected by legal privileges.
6. Personnel, medical, financial, and similar files where disclosure would constitute a clearly unwarranted invasion of personal privacy.
7. Certain types of information compiled for law enforcement purposes.
8. Records that are contained in or related to examination, operating, or condition reports prepared by, on behalf of, or for the use of any agency responsible for the regulation or supervision of financial institutions.
9. Geological and geophysical information and data, including maps, concerning wells.

(Source: http://www.fincen.gov/foia/foia_exemptionsexclusions.html)

Privacy Rights

The Privacy Act of 1974 prevents government agencies from excessive disclosure of personal information maintained by the government and grants individuals increased access to government records maintained on themselves. The Privacy Act protects civilians, military personnel and government employees. Because Navy public affairs professionals inherently have access to personal information, an understanding of the Privacy Act is required.

Privacy Act Exceptions

The Privacy Act allows for exceptions to the general rule of "no disclosure without consent" based on the following 12 exemptions:

1. When a transfer of personal information is made within an agency and the receiving office has a bona fide need to know – the Navy and all its components are considered agencies
2. When required under FOIA
3. When the record or document is used as part of published "routine uses"
4. When requisite information is furnished to the U.S. Census Bureau
5. For bona fide statistical use in a form in which subjects cannot be identified
6. To the National Archives as a historical document

7. With the written request of an agency head, to a law enforcement agency and for law enforcement purposes
8. In an emergency when personal health or safety is threatened
9. To either House of Congress or – to the extent of matters within its jurisdiction – any Congressional committee
10. To the Comptroller General
11. By order of a court from a court of competent jurisdiction (signed by a state or federal court judge)
12. To a consumer reporting agency

Generally Releasable Information under the Privacy Act

The following personal information is releasable and not considered an invasion of personal privacy:

For Navy Civilians:

1. Name
2. Present and past grades
3. Present and past salaries
4. Present and past duty stations
5. Office or duty telephone number(s)

For Military Service Members

1. Name
2. Rank and date of rank
3. Designator or rating
4. Gross salary
5. Present and past duty stations
6. Future assignments that are officially established
7. Office or duty telephone number(s)
8. Date and source of commission/enlistment
9. Home of record (state only)
10. Promotion sequence number
11. Awards and decorations
12. Attendance at professional military schools
13. Duty status at any given time (active, reserve)
14. Official photograph

Health Insurance Portability Act of 1996

The unauthorized release of Protected Health Information (PHI) is a crime. To safeguard PHI, military treatment facilities have implemented the HIPAA policies contained in the [DoD Health Information Privacy Regulation](#), which prohibits the release of information unless allowed by the patient or by specific exception.

PHI is individually identifiable health information of an individual, relating to past, present or future medical conditions. HIPAA prohibits the release of PHI in any form -- verbal, written or electronic.

A signed, HIPAA-compliant consent form, [DD Form 2870](#), from the patient is required to disclose PHI. Even with consent, a reasonable effort must be made to limit the use, disclosure or request of PHI to the minimum necessary to accomplish the intended purpose.

Unless a patient objects or requests to have PHI restricted through the use of [DD Form 2871](#), the Navy may release without prior patient authorization a one-word condition to individuals who inquire about a patient by name. A patient's room number may not be given to the media without the patient's authorization. A general location such as intensive care unit, burn unit, etc., is permitted.

Only medical professionals are authorized to determine condition descriptions. There are five approved conditions:

1. Undetermined
2. Good
3. Fair
4. Serious
5. Critical

HIPAA regulations do not apply to:

- Authorized DoD drug testing programs
- The Armed Forces Repository of Specimen Samples for the Identification of Remains
- Reserve component medical activities that are not practicing in a military treatment facility
- Military Entrance Processing Stations
- Nor do they apply to foreign national beneficiaries of the military health system when such care is provided in a country other than the United States.

Copyright Law

Copyright law is found in Title 17 of the United States Code and it protects the right of an original creator to control and profit from the production of their original work. Copyright law prohibits the reproduction, distribution, adaptation, performance, or display of copyrighted material without the copyright owner's permission. With the enactment of the 1998 Digital Millennium Copyright Act, copyright protection expands to cover digital material regardless of the format or medium.

The eight categories of copyrighted materials are:

1. Literary works
2. Musical works, including any accompanying words
3. Dramatic works, including any accompanying music
4. Pantomimes and choreographic works
5. Pictorial, graphic, and sculptural works
6. Motion pictures and other audiovisual works
7. Sound recordings
8. Architectural works

Copyright laws do not pertain to facts, events, ideas, plans, methods, systems or blank forms. Trademark laws, not copyright laws, protect words, names, and symbols used by organizations to identify and distinguish themselves among others.

Copyright Law and U.S. Government Employees

Copyright protection is not available for works prepared by employees of the United States government as part of their official duties. However, works created by federal employees off-duty using equipment they own may be copyrighted.

Use of production music

MCs must be aware of the use of copyrighted music when producing multimedia, audio and video products. Copyright permissions for the music and sound effects issued to ships and stations typically are for broadcast use and are not authorized for online use. MCs need to ensure their productions are free of copyrighted materials prior to uploading online.

Copyright-free production music is available through the Navy Band, a variety of music loop generators or through royalty-free production music sources. CHINFO maintains a Navy enterprise license with Killer Tracks, a production music library resource. This license allows Navy units access to the library on-line in multiple file formats. Email NavyMedia@navy.mil to receive information on how to access Killer Tracks.

For more copyright information:

<http://www.copyright.gov>, U.S. Copyright Office

[DoD Directive 5535.4](#), Copyrighted Song and Video Recordings

[SECNAVINST 5870.4A](#), Copyright