



# COLOR CODE

## Interpretations and Perceptions of Colors in our World

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### QlikView Technical Brief

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Apeksha Pathak

UI Designer

Demo and Best Practices Team



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## Introduction

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“Colors, like features, follow the changes of the emotions” – Pablo Picasso

Have you ever thought how a color can influence your behavior, feelings and thoughts and whether you like something or not?

Colors for us are not just an important part of our visual senses but share a deeper relationship with our brain and psychology than just helping us to identify objects. Different colors trigger different emotions within us, positive and negative. Nearly all the associations, in all the aspects of our lives are made with colors. Studies and our personal experiences show that colors are so powerful and meaningful to us that they can influence our mood, cognition, emotion, memory and entire lives.

As much as various colors share universal codes and meanings, colors have varied interpretations in different cultures and around the world. As designers, it is very important for us to understand the various interpretations of colors and how they affect the psychology of people from across the world in order to use colors in a mindful and informed way in our designs.

This paper intends to talk about the symbolism and interpretations of color in Theories, Cultures, ideas, feelings, occasions, Marketing, Universal codes, in data and with respect to accessibility.

## Color Theory

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Colors have their own characteristics and also share a relationship with each other. Knowing about these characteristics and how different color interact with each other and appear in each other's presence can help tremendously in making color choices, color schemes and color palettes for designs.

### COLOR PROPERTIES

Color properties help us to distinguish and define colors. These properties help us identify a color from its close relative. As a designer, it is important to know various properties of color.

Hue

Hue is the actual color in its purest form without the mixture of white or black. For example, Red- 255, 0,0 ; Green – 0,255,0 ; Blue – 0,0,255 or yellow – 255,255,0



Saturation

Saturation is defined as the dominance of hue in a color. For instance, in the example below, the saturation of the color red decreases from left to right.



Value

Value is the lightness or darkness of a color. Light colors are called tints and dark colors are called shades.

Tints

Tints are the hues of the color mixed with white. The tints of red are shown below.



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## Shades

Shades are the hues of the color mixed with black. The shades of red are shown below.



## COLOR SCHEMES

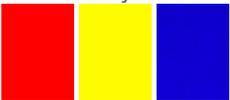
### THE COLOR WHEEL



To study color schemes, one first needs to understand the color wheel and its composition.

A color wheel consists of Primary, Secondary and tertiary colors. Generally, in a color wheel there are 3 primary colors, 3 secondary colors and 6 tertiary colors.

**Primary colors** – Primary colors are red, yellow and blue. These colors are used as the base for making secondary and tertiary colors. These colors cannot be made by combining any colors and are hence called primary colors.



**Secondary colors** – Secondary colors are made by the combination of various primary colors. They are orange, green and violet.



**Tertiary colors** – Tertiary colors are made by combining one primary with one secondary color. The combinations and proportions of primary and secondary colors give rise to various tertiary colors.



## COLOR CONCEPTS

**Warm Colors** - Warm colors are tints, shades and combinations of the colors red, yellow and orange. These colors tend to give a feeling of warmth, heat, sunlight and hence are called warm colors.



**Cool Colors** – Cool colors are tints, shades and combinations of the colors blue, green, violet. These colors tend to

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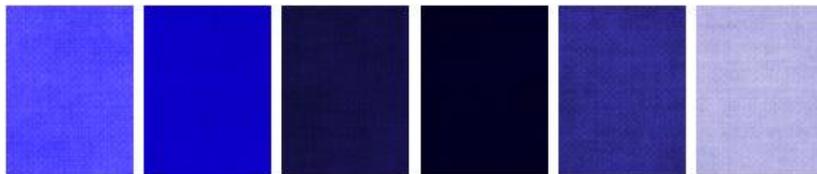
give a feeling of coolness, water, sky and hence are known as cool colors.



## COLOR RELATIONSHIPS

There are 7 color relationships or color schemes – monochrome, analogue, complementary, triad, tetrad, neutral and random. 4 of the 7 color schemes are discussed below.

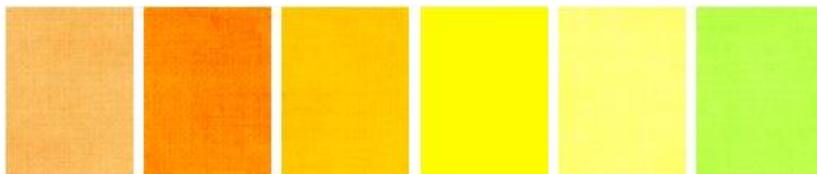
**Monochrome** – A monochromatic color scheme is when different shades and tints of only one color are used in combination.



**Significance** – A monochromatic scheme of any color always seems to give a sense of unity since all the colors are derived from the same hue. This color scheme can make things appear to blend into one another. A streak of a hue different than the monochromatic scheme can add attention seeking material and can be great to pull attention.

**When to use** – A monochromatic scheme is very useful when few things need to stand out while the other needs to blend into the background of the monochromatic scheme. This color scheme is great for dashboards where 1 part of the KPI needs to stand out.

**Analogue** – An analogous color scheme is made up of colors that sit next to each other on the color wheel or sit alternatingly on the color wheel.

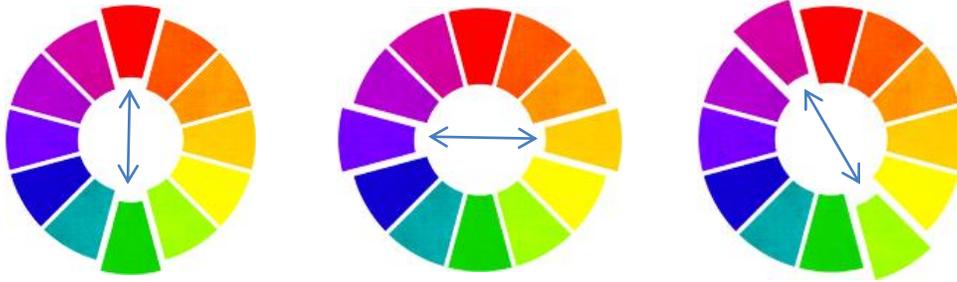


**Significance** – The analogous scheme is made up of colors that are closely related to each other which make it easier for the brain to see similarities in them. Thus even then there is more than one color; there is still a sense of unity in the color scheme.

**When to use** – Analogous color scheme is useful when less contrast needs to be shown in a particular design and some blending is required between elements of different color. This color scheme is great when showing similarities in data or when showing data sets that share a relation.

**Complimentary** – Complimentary color scheme is made up of pair of colors which sit directly opposite to each other on the color wheel.

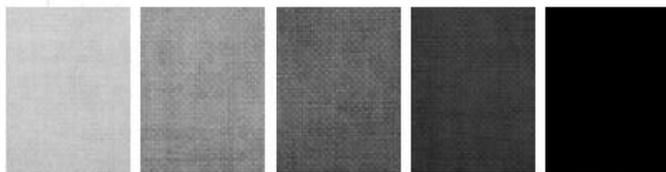
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**Significance** – Complimentary colors are always contrasting each other because of their placement on the color wheel. Also due to the combination of colors from 2 different spectrums, the appearance of the hue of both colors looks most saturated when next to each other since one always comes from the family of cool colors while other is from warm colors.

**When to use** – A complimentary color scheme is useful when a heavy contrast between colors needs to be shown and when you want to draw attention to multiple areas at the same time. A contrasting color can be used with a monochromatic color scheme for showing 1 point in data which stands out.

**Neutral** – A neutral color scheme only involves variations of black and white.



**Significance** – As the name suggests this color scheme is neutral.

**When to use** – Neutral color scheme is useful when no color needs to be shown and the design needs to be kept neutral from other color variations.

## General Color Associations (ideas, concepts, emotions)

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Colors have evolved to hold certain meanings and associations in the human world. Different colors affect the human psychology in different ways; they can change actions, cause a reaction, irritate or soothe the eyes and give rise to a whole lot of emotions within us. Though the meaning and symbolism of colors differs from culture to culture, colors also share some universal associations among people.

As designer, it is important to consider the associations that colors hold in order to use them in the right way to evoke desired emotions within the audience.

The table below shows the associations with respective colors in the form of word tags.

## GENERAL ASSOCIATION OF COLORS WITH IDEAS AND CONCEPTS

Color	Association	Connotation
<b>Red</b>	 Excitement, energy, passion, love, desire, speed, strength, power, heat, aggression, danger, fire, blood, war, violence, intense, passionate, feminine	Positive & negative
<b>Pink</b>	 love and romance, caring, tenderness, acceptance, heart, blushing, feminine, birth, cake, candy, sweet, playful, immaturity, baby girls	Mostly positive
<b>Ivory &amp; Beige</b>	 quiet, pleasantness, pureness, warmth, weak	Neutral and positive
<b>Yellow</b>	 bright, energy, sun, creativity, intellect, happy, joyous, gold, friendship, life, summer, fever, sickness, epidemic, stale, uplifting, coward, irresponsible, unstable, gender neutral, warning, dirt	Positive & negative
<b>Orange</b>	 Energy, enthusiasm, warmth, autumn, vibrant, expansive, citrus, flamboyant, demanding of attention, activity, appetite, socialization	Positive
<b>Blue</b>	 Ocean, water, sky, cool, nature, earthy, peace, tranquility, calm, stability, harmony, unity, trust, confidence, clean, constant, masculine, dreams	Positive
<b>Green</b>	 Nature, environment, healthy, good luck, good, renewal, youth, spring, generosity, fertility, vigor, money, earth, fresh, balance, harmony, jealousy, inexperience, envy, misfortune, military, wealth	Positive
<b>Purple</b>	 Royalty, noble, ceremony, transformation, wisdom, rich, spirituality, creativity, wonder, luxury, mystery, sickness, honor, mourning, poison, auspicious	Mostly Positive
<b>Brown</b>	 Earth, stability, hearth, home, outdoors, reliability, comfort, endurance, simplicity, and comfort, rustic, barren, wholesome, dirt, neutral, strength	Mostly positive
<b>Grey</b>	 Cold, gloomy, moody, sad, conservative, solid, metal, mourning, intelligence, reliability, solid, maturity, old age, modesty	Mostly negative
<b>White</b>	 Reverence, purity, birth, simplicity, cleanliness, peace, humility, precision, innocence, youth, winter, snow, good, sterility, marriage (Western cultures), death (Eastern cultures), cold, clinical, formality, strength, compromise, blank, light	Positive and negative
<b>Black</b>	 Power, sexuality, sophistication, formality, elegance, wealth, mystery, fear, evil, unhappiness, depth, style, evil, sadness, remorse, anger, anonymity, underground, mourning, death, darkness	Positive and negative

## Colors in Cultures

Colors choices vary from person to person. Sometimes this is due to personal preference and other times it is due to cultural background and beliefs. Every society, culture and religion associates different colors with different ideas and concepts. Color significance in different cultures is so deep rooted that it defines that object or idea. Hence a color can be a very strong indicator of that idea, concept, object or occasion in various cultures and religions. For us as designer, it is important to be mindful of the various color connotations so as to make sure of abiding to various limitations that come with it. We strive for a global outreach as more and more of our audiences today come from different parts of the world. Color being an essential factor in design, we need to take into consideration the effects and interpretations of colors in various societies in order to use them consciously in our designs.

Let us look at some common colors and their significance in various cultures and religions.

### 1. RED ■

**Eastern Cultures** – Prosperity, good fortune, auspicious, marriage

**Western Cultures** – Energy, adrenaline, danger, stop, anger, love, passion, Christmas, Valentine's Day

Country / Culture	Association	Connotation
USA	Love, passion, Christmas, US flag – patriotism, blood, anger, safety, rescue, hot, spicy	Positive & Negative
China	Good luck, celebration, new year, vitality, happiness, long life, weddings,	Positive
India	Wedding, auspicious, married women, fertility, wealth, power, holy, fire	Positive
Thailand	Color for Sunday	Neutral
Japan	Life, anger, danger	Positive & Negative
Cherokees	Success, triumph	Positive
South Africa	Mourning	Negative
Nigeria	Ceremonies, color of the chiefs	Positive
Russia	Bolsheviks and Communism, beautiful, marriages	Positive

<b>Australian aborigines</b>	Land, earth, ceremonies	Positive
<b>Latin America Mexico</b>	Religious color, sunny, vibrancy, intensity, death	Positive & Negative
<b>Middle East</b>	Color of evil, danger, caution	Negative
<b>Caribbean islands</b>	African roots, nature, animals	Positive
<b>South America</b>	Craftsmanship	Positive
<b>Brazil</b>	Visibility, Vibrancy	Positive

## Religious symbolism

<b>Religion</b>	<b>Association</b>	<b>Connotation</b>
<b>Christianity</b>	Passion, love, sacrifice	Positive
<b>Hebrew</b>	Sacrifice, sin	Negative
<b>Hindu</b>	auspicious, fertility, wealth, power, holy, fire	Positive
<b>Buddhist</b>	Sacred, life force, preservation, longevity	Neutral

## 2. PINK ■

**Eastern** - feminine

**Western Cultures** – feminine, love, romance

<b>Country / Culture</b>	<b>Association</b>	<b>Connotation</b>
<b>USA</b>	Valentine's day , love, spring, cherry blossoms	Positive
<b>Europe</b>	feminine, baby girls	Positive

Belgium	Baby boys	Positive
Japan	Spring, cherry blossoms	Neutral
Thailand	Color of Tuesday	Positive
Korea	Trust, wedding	Positive

### 3. YELLOW ■

**Eastern** – imperial, sacred

**Western Cultures** – happiness, summer, joy, hope, cowardice, warning, transportation

Country / Culture	Association	Connotation
China	sacred, imperial, honor, masculine	Positive
India	Sacred, auspicious, health, merchants, gold, affluence	Positive
Thailand	Auspicious, Buddhism, royal, color of Monday	Positive
Egypt	Mourning	Negative
Burma	Mourning	Negative
Japan	Courage, beauty, aristocracy, cheerful	Positive
Europe	Happiness, cowardice, warning	Positive & negative
Greece	Sadness	Negative
Africa	High rank	Positive
Malaysia	Color of Islam	Positive

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USA	Summer, fall	Positive
Middle east	Happiness, prosperity	Positive
Israel	Jews in middle east	Neutral
France	Jealously	Negative

## 4. ORANGE ■

**Eastern** – happiness spirituality

**Western Cultures** – autumn, harvest

Country / Culture	Association	Connotation
USA	Fall, harvest, Halloween, thanksgiving, November, road hazards, traffic delays, fast food restaurants, cheap	Positive & Negative
India	Saffron, holy, sacred, religious, purity, abstinence, god	Positive
Thailand	Color of Thursday	Neutral
Ireland	Religious for protestants, patriotism	Positive
Netherlands	Color of Dutch royal family	Positive

## 5. BLUE ■

**Eastern** – immortality, religion, nature

**Western Cultures** – trust, authority, corporate, formal, calm, peace, masculine. Depression, sadness

Country / Culture	Association	Connotation
USA	Liberalism	Positive
UK & Europe	Conservatism	Positive

<b>India</b>	Deity, God, Creator, bravery, manliness, determination,	Positive
<b>Ireland</b>	Religious for protestants, patriotism	Positive
<b>Netherlands</b>	Color of Dutch royal family	Positive
<b>China</b>	Immortality	Positive
<b>Japan</b>	Art and clothing that symbolizes the ocean	Positive
<b>Germany</b>	Employee dismissal letters	Negative
<b>France</b>	Royalty, aristocracy	Positive
<b>Iran</b>	Mourning, heaven, spirituality, immortality	Negative & Positive
<b>Korea</b>	Color of mourning	Negative
<b>Thailand</b>	Color of Friday	Neutral
<b>Egypt</b>	Virtue, protection from evil	Positive
<b>Middle East</b>	Protection	Positive
<b>Columbia</b>	Associated with soap	Positive
<b>Cherokees</b>	Defeat, trouble	Negative

## Religious symbolism

<b>Religion</b>	<b>Association</b>	<b>Connotation</b>
<b>Christianity</b>	Christ's color	Positive
<b>Judaism</b>	Holiness	Positive

Hindu	Color of deity Krishna	Positive
Catholic	Color of Mary's robe	Positive

## 6. GREEN ■

**Eastern** – life, regeneration, hope, fertility

**Western Cultures** – luck, birth, nature, 'go', Christmas, jealousy, greed

Country / Culture	Association	Connotation
China	New life, regeneration, hope, fertility, infidelity, exorcism	Positive & Negative
India	Islam, hope, harvest, virtue, military	Positive
Thailand	Color of Wednesday	Neutral
Japan	Eternal life, youthfulness, freshness	Positive
Indonesia	Forbidden color	Negative
Ireland	Religious color, St Patrick's day, Emerald Isle	Positive
North Africa	Corruption, drug packaging	Negative
Egypt	Hope, Spring	Positive
Middle East	Islam, strength, fertility, luck	Positive
Saudi Arabia	Wealth, prestige	Positive
USA	Christmas, St. Patrick's day, Money, jealousy	Positive & Negative
Latin America	death	

## 7. PURPLE

**Eastern Cultures** – wealth

**Western Cultures** – royalty, wealth, high rank, military honor

Country / Culture	Association	Connotation
India	Wealth, royal	Positive
Thailand	Mourning for widows, color of Saturday	Negative
Japan	Wealth, privilege	Positive
Brazil	Death, mourning	Negative
Europe	Royal	Positive

### Religious symbolism

Religion	Association	Connotation
Christianity	Mourning, death, crucifixion	Negative

## 8. BROWN

**Eastern Cultures** – earth, nature, mourning

**Western Cultures** – earth, practical, comfortable, national parks, wholesome, barren, stable, dependable

Country / Culture	Association	Connotation
China	Earth	Positive
Nicaragua	Disapproval	Negative

Columbia	Discouraging	Negative
Middle east	Earth, comfort	Positive
USA	Health, stable, wholesome, national parks, packaging, barren	Positive & Negative

## 9. WHITE

**Eastern Cultures** – death, mourning, funerals

**Western Cultures** – brides, weddings, angels, hospitals, doctors, peace, surrender, purity

Country / Culture	Association	Connotation
China	Death, mourning, virginity, purity, humility, age, misfortune	Positive & Negative
India	Unhappiness, death, widow, funerals, peace, purity	Positive & Negative
Japan	Death	Negative
Thailand	Purity	Positive
Korea	Purity, innocence, mortality, birth, death	Positive & Negative
Middle East	Purity, mourning	Negative
USA	Weddings, Brides, purity	Positive
Latin America	Peace, purity	Positive
Iran	Holiness, peace	Positive
Egypt	High rank	Positive

**Eastern Cultures** – wealth, prosperity

**Western Cultures** – power, control, funerals, death, mourning, rebellion

Country / Culture	Association	Connotation
China	Color of young boys	Positive
India	Evil, darkness, black magic, unknown	Negative
Japan	Mystery, night, provocative, evil, threat	Negative
Thailand	Unhappiness, bad luck, evil	Negative
Africa	Age, wisdom	Positive
Middle East	Evil, mystery	Negative
USA \ Europe	Funerals, death, Priests, punk band	Negative
Latin America	Masculinity	Positive

### Religious symbolism

Religion	Association	Connotation
Judaism	Unhappiness, bad luck, evil	Negative

## Most Preferred / Safe color to use

Color meaning and interpretations change drastically from culture to culture, so which color should be considered safe to use for a global audience? Does it matter?

Research shows that colors play a very significant role in whether your audience is drawn towards your product or is repelled away from it. Since different colors are interpreted differently across cultures, it is important to choose colors wisely in design while branding, marketing and promoting products.

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In a survey conducted by 3 Global Marketing firms, it shows that the color blue is the most favorite color among people in 17 countries.

42% of Americans are fans of blue, as are 47% of Germans and 44% of Brazilians. Overall, 40% of people worldwide picked blue as their favorite color.

Blue seems to be the safest color to use since most cultures do not have negative connotations attached to blue. Also, since it is the color of sky, water and ocean, it has a soothing effect and can be considered neutral.

Another very big reason of choosing the color blue is that it doesn't come under the 2 common colorblindness color spectrums, Protanopia and Deutanopia which are very common especially in males, so it can be considered a colorblind safe color. Even the links in Google and other places are blue in color.

We see majority of global companies using the color blue either in their branding, logo or websites.



The effect of colors and meanings associated with them are essential to consider when you are presenting to different cultures or a global market. When targeting audience from different cultures where the meaning of certain colors or combination of colors is different, it is best to adopt a customized approach with respect to colors associated to brands, application look and feel and so on. However, when targeting a global market, it is best to use colors which can be considered as safe in terms of connotations and accessibility.

A study was conducted by American researchers in 1999 across 8 different countries to explore how consumers in these countries view colors in terms of their meanings. The study showed that blue, green and white followed by black and brown were the colors that people from most countries associated with similar meaning. However, they found that the meanings associated with the color Red were dissimilar in different countries. This shows that Red is probably not the best color to use when it comes to reaching out to a global audience due to the differences in the connotations for the color red.

## Climate and Colors

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Ever wondered why people dress up so colorfully and brightly in India and on the other side of the globe in a European countries people wear lighter, paler looking colors?

Psychologist E.R Jaensch's research indicates that people who live in climates with a lot of sunlight prefer warm bright colors; while those from climates with less sunlight prefer cooler, less saturated colors.



Also environment and climate determines the way colors are classified according to the relevance they have in everyday life. For instance, Eskimos use 17 different classifications for white based on snow conditions.

So, for sales consultants trying to woo customers in Europe, it will be advisable to use sober, less saturated colors which can be a general rule of thumb, but on the other hand, colors can be on a brighter more colorful side when wooing customers in warm countries like India because bright colors will be appreciated and welcomed due to the overarching use of them in other aspects of life.

## Universal Color Codes

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Though colors are perceived differently in different parts of the world, there are some color connotations and usage that are recognized universally. For instance, the soft shade of blue will always trigger the association with sky throughout the world and likewise green will always be associated to vegetation or freshness.

Some colors however, are used universally for a certain phenomenon for scientific reasons. For instance, the color red is used to alert users and to indicate 'Stop' because the human eye has more red receptors than other colors; hence the color red is recognized by humans instantly and is alerting.



Also since globalization, it became necessary to follow standards. Colors are an important part of setting standards for public signage and information display.

Below are some colors that are universally recognized and used for the same purposes and reasons.

### Traffic Lights

Mostly, all around the world, the colors Red, Yellow and Green are used for traffic lights. These

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colors were first used in the railway industry to stop train collisions from happening and were later adopted to control road traffic.

The color red, as we all know, indicates danger since it is the color of blood. Also the red light is caught by the human eye instantly and cannot be ignored.

Similarly, yellow is a bright color which is closer to red but not as deep and attention seeking as red. Thus this color is used for caution and to indicate to slow down.

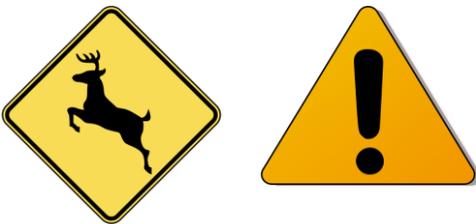
Green is a soothing color for the eye and indicates no danger. Since, the railroad industry a standard color palette is used for traffic lights around the world.

## Stop Signs



Since the color red is associated with danger and is also the most attractive color to the human eye, it is used all around the world to indicate STOP.

## Caution Signs



Bright yellow color is an attention seeker. Thus, the color yellow is often used for caution signs all around the world.

## Red Cross for Hospital Signage



## White Coats for Doctors



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## Colors Standardized for public Signage by ISO (International Organization for Standardization)

### Yellow for Warning Sign:



General warning sign



Warning: Electricity



Warning: Hot surface

Yellow triangle with black border with back symbol is standardized by the ISO for warning signs.



General prohibition sign



No smoking



Do not use lift in the event of fire

Red ring and diagonal bar with back symbol is used by ISO for prohibition signs.



General mandatory action sign



Wear protective gloves



Refer to instruction manual/booklet

Blue circle with white symbol is used by ISO to specify action required for safety



Emergency telephone



Break to obtain access



Emergency exit (right hand)

Green Square with white symbol is used by the ISO for indicating evacuation routes and assembly points, location of first aid, emergency equipment.



Fire extinguisher



Fire alarm call point

Red Square with white symbol always with flames is used by the ISO to indicate fire equipment.

## Colors in Data

The universal color codes have cascaded into the use of colors in data to some extent. For instance, even in a business dashboard, viewed on a computer screen, the color red still represents danger or something gone wrong. And the color yellow represents a warning. The human eye is very sensitive in detecting color variations, which is why color in data becomes essential factor in determining the good & bad patterns, loopholes etc.

Edward Tufte cites the example of the Swiss Mountain map as an exemplary work of using colors effectively in data, in his book 'Envisioning Information'. As Tufte mentions, color is perfectly used to represent data in this map in the form of



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1. Labels (color as noun)
2. to measure (color as quantity)
3. to represent (color as representation)
4. to enliven or decorate (color as beauty)

Colors play an important role in feature or object identification in maps. Universally, in every map, blue will be recognized as water, green as land or tress, black as other features like roads & contours, etc. These color associations are based on colors that we all see in nature and hence are associated to those respective things everywhere in the world. Thus colors used for data in maps are universally recognized, but what about the colors used in charts and graphs, do they have cultural implications?

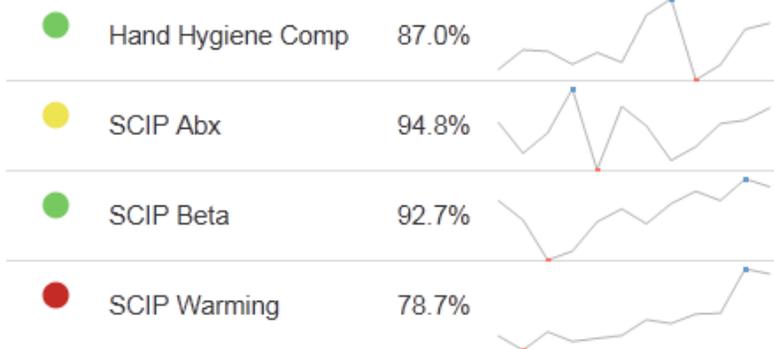
Cultural connotations that are attached to colors in different parts of the world might play a role in representing colors in data to specific audience. With that one must also keep in mind that when color is used as a medium of communication in data such as maps and charts, color is more than just a mere filler but is a factor that defines the data, and more than cultural, it has scientific reasoning.

For instance, the color Red in the Chinese culture represents good luck, celebration and happiness, overall representing good, but does that mean that if a Chinese user sees a red indication on a Business Dashboard he will think that things are good? Probably not.

**Red in Chinese culture represents joy, celebration and happiness. However, on a dashboard, Red represents the opposite.**

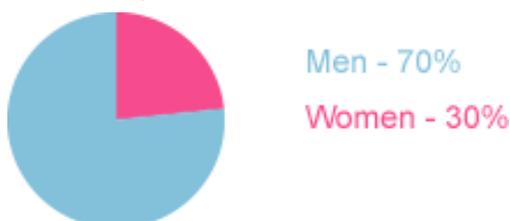


## Clinical Care Metrics



So, do cultural associations matter when it comes to representing color in data? Let us analyze another example to better understand the answer to this question.

In presenting Male and female population in the form of a pie chart, generally blue is represented for Males and pink for females, in the western world as shown below.



In this visualization, the pie chart alone can communicate that the ratio is between males and females without looking at the text legend. However, if the same chart was shown in Belgium, pink would represent Baby boys and the chart

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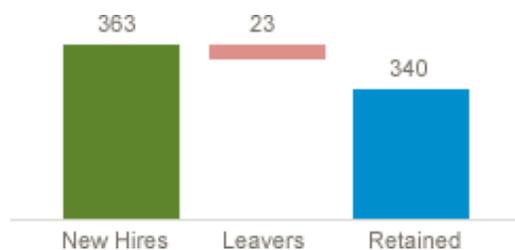
would be misinterpreted.

Thus, we can conclude that there are some standards adopted all over the world when it comes to representing certain colors namely red, green and yellow and their connotation remains universal when represented in data or in reference with using them to show stages of a certain process. But, beyond the standard universal color code, color connotations are subjective to every nation, culture, religion and belief. Thus the context and audience have to be considered when it comes to color representation in data.

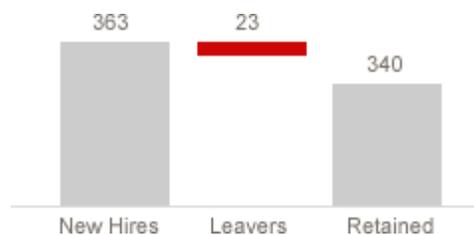
That said, there are certain dos and don'ts that one can follow when using color in data. The purpose of using colors in data is to distinguish one element from another. So, when colors of the same intensity are used, it becomes difficult for the human eye to spot the trends, outliers etc. To maximize the effect of color to represent the information effectively color should be used sparingly.

Using light colors for backgrounds and high intensity colors to highlight information can not only display information better but also enhance usability. This is represented in the charts below.

## Color Clutter should be avoided



## Colors used in contrast makes the important data Stand out



## Color Accessibility

An application or design reaches its utmost goal when usability goes one step forward and turns to accessibility. Color accessibility is one of the most essential factors to consider while choosing color palettes for your design. According to the world statistics, Colorblindness affects at least 1 in 12 men and 1 in 200 women which can be an unaffordable price to pay if not taken into account.

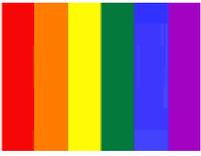
Though color blindness forms a major factor of consideration for color disability, color accessibility is not confined to it but extends to audience above age 60 which less powerful vision and to the rest of us who suffer from some kind of situational disabilities like glare on computer screen and so on.

### Colorblindness

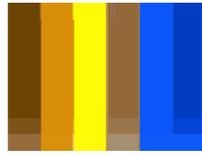
Colorblindness is a very common disorder seen mostly in men and in 0.5% women. This disorder causes inability to distinguish between certain colors depending on the type of disorder.

There are 3 types of colorblindness, the first 2 being the most common and the 3<sup>rd</sup> type being a rare one.

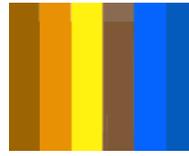
# QlikView



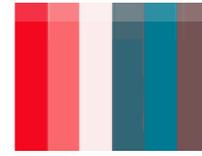
**Normal Vision**



**Protanopia** - Inability to distinguish between hues of Red, Green and yellow but weak in sensitivity to Red color.



**Deuteranopia** - Similar to Protanopia but weak in sensitivity to Green color.



**Tritanopia** – Insensitivity to Blue and yellow colors where blue appears in a different hue and yellow appears as pink

## Factors to consider

Due to this disorder being very common, it becomes of high priority for designs to comply with color accessibility factors. Few tips and tricks are to use colors with various hues and tints of the same color next to each other. This makes it easier to differentiate between colors belonging to the same family. Also, while using contrast for text and background, it is best to stick to the standard black and white colors, preferably black text on white background.

## Using Shades and Tints of the same color to enable color blindness compatibility



## Using White text on Black background



Another tip would be to use icons in addition to color for indication since using color as the only medium of communication can be dangerous when aiding color blindness.

## Weak Visual Capability

Visual capabilities start diminishing with age. Older people with weaker visual capabilities are among a considerable number of audiences. Color contrasts and combinations play very significant role in aiding people with weak visual capabilities.

For instance, colors used for text and background matters a lot when it comes to legibility; however, it matters even more when considering weak visual capability audience. Using light backgrounds and light text is not legible and using a bright colored text and bright colored background is jarring. White background and black text works best.

## Summary

In our world, colors are not just rays of light reflecting in different wavelengths but have become a language, a medium of communication, element of psychological phenomenon – causing reactions, triggering memories and providing relief. They hold deep rooted meanings and symbolize ideas, emotions and concepts.

The power of colors can either make or break things. The fact that the same color can have different connotations in

# QlikView

across the world is a good enough reason to use colors consciously and intelligently. Colors form an essential part of our everyday life, for us as designer, it is important to understand the various implications that colors have on our audience to make a positive impact.

## References

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List any references here such as links to supporting material or related technical briefs or white papers.

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Envisioning Information – by Edward Tufte

## Appendix

A short survey was conducted within the Demo and Best practices team at Radnor of what some people think of or associated the below colors with. The survey results were very interesting, though people associated the colors with similar connotations, different colors reminded them of different things based on their past experiences or life style and surroundings. This makes it evident that colors are very effective elements that are always suggestive or certain things which differ from person to person based on the background and culture. Below are the things that people associated the given colors with.

### GENERAL ASSOCIATIONS WITH COLORS

Color	Association	Connotation (Positive / Negative / Neutral)
Red	 Love, heart, stop, yield, attention, bold, flashy, Hot, fire, dangerous, the devil, spicy, romance, aggressive, Love, Anger	Both positive and neutral, Negative
Pink	 Girl, baby, Girly, candy, teenage, punk, feminine, Spring	positive
Ivory & Beige	 Neutral, calm, Plain, boring, Skin, Elephant Tusks	neutral
Yellow	 Sunflower, sun, bright, spring, summer, lemon, Warning, danger, Flower	Positive, Negative
Orange	 Bright, spring, bold, oranges, Energetic, warm, fun, Pumpkin, Halloween	positive
Blue	 Boy, sports, sky, water, Cool, sad, calm, quiet, Water, Penn State!!	Positive, Negative
Green	 Grass, earth, conservation, trees, outside, Natural, trees, fresh, Irish, Money	positive
Purple	 Pleasant, Easter, Minnesota Vikings	positive
Brown	 Dirt, soil, mud, Earthy, neutral, natural, dirty, UPS, Autumn	Neutral, Negative
Grey	 Neutral, middle-ground, light, Quiet, sad, gloomy, Old, Coins	Neutral, Negative
White	 Bright, wedding, fresh, pure, clean, Cotton, Snow	Positive, Neutral
Black	 Bold, harsh, formal, sharp, elegant, Dark, rebellious, Night, Death	Both positive and negative