



# Microsoft® Tag Implementation Guide

*Practical requirements and recommendations to ensure  
successful Tag production*

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# Introduction

This document is for everyone who designs Microsoft Tag solutions. It describes practical considerations for successfully creating and deploying Tag barcodes, QR Codes, and NFC URLs using the Microsoft Tag solution. It offers instructions and best practices for streamlining production, verifying usability, and ensuring a superior user experience.

This document is part of a series of guides that supplement information available on the [Microsoft Tag](#) and [Microsoft Tag Developer Center](#) websites. It will be updated and expanded as the Tag solution evolves. Check the [Microsoft Tag](#) website for the latest version of this guide.

# Best Practices

Tag barcodes, QR Codes, and NFC URLs should be produced and displayed so that users can physically locate and scan them reliably with their mobile devices. Choose a delivery medium that makes practical sense for your campaign and the type of recognition technology you use. Each type has slightly different requirements in terms of discoverability, usability, and accessibility. This implementation guide describes requirements and best practices for working with Tag barcodes, QR Codes, and NFC URLs using the following media types:

- **Print**—Magazines, posters, flyers, pamphlets, product packaging, and other printed media.
- **Electronic displays**—Computer screens, TVs, JumboTrons, and other light-emitting media.
- **Apparel and other media**—Screen-printed on clothing or composed of other materials, such as embroidery, a chocolate wafer, on a watch face, or printed on a bottle, to name a few possibilities.

One of the great things about new marketing tools is the wave of creative energy they unleash. Think of all the clever places you've seen promotional content from skywriting to advertisements on grocery store floors. So too with mobile marketing; the natural inclination is to use recognition technologies such as Tag in a number of unusual locations.

As you plan ways to incorporate recognition technologies in your campaign, you should map out the likely usage scenarios and consider the pros and cons of placing your items in different places and situations. Make sure to ask—and answer—the following questions:

- What materials will your Tags be made of?
- On what kinds of surfaces will you place your Tags?
- What are the physical conditions or environments in which users will discover your Tags?
- How will users be expected to interact with the content in your Tags?

These practical recommendations can help guide you in creating and displaying Tags to successfully communicate the encoded information you want to share with your audience.

## DO'S AND DON'TS



### DO

- **Define your target audience and communications goals:** Make sure your experience is timely and useful.
- **Offer a clear value:** Design your materials to ensure people know what to do and what they'll get.
- **Think globally:** Consider globalization and localization issues in large campaigns, including social and political appropriateness, user comprehension, and so on.
- **Include instructions:** Tell people how to interact with your content with clear user instructions and context for your Tag barcode, QR Code, or NFC touchpoint.
- **See how people react:** Field-test your campaign experience with a cross-section of target users. Step through the entire real-world user experience to solve problems proactively.
- **Maintain image proportions and white border.** Make sure your Tag barcode or QR Code image isn't distorted during the design and print process and that your design doesn't impinge on the mandatory white border around your Tag or QR image.

- **Thoroughly test** each type of recognition technology you use:
  - In the actual target environment.
  - Using a variety of high-end and low-end devices from a variety of manufacturers.
  - On devices that run a variety of operating systems.
  - On devices that use a variety of web browsers.
  - On every type of surface you plan to use. Go through the complete printing or production process, particularly with unusual materials, such as food or fabric.



## DO NOT USE RECOGNITION TECHNOLOGIES

- **In situations that would be unsafe for users to scan the item.** Billboards, for example, are okay for pedestrians and passengers, but a Tag barcode on a billboard along a busy highway may be a dangerous distraction for drivers.
- **In locations that are difficult or impossible for users to be able to scan reliably.** A Tag barcode displayed on the side of a city bus, for example, will be tough to scan when it's moving through traffic.
- **In locations with poor cell reception.** Be mindful of situations where users may have a poor or no cell signal. Signage in subways, for example, can be problematic.
- **On surfaces that are too reflective, curved, or irregularly shaped.** Glass can be difficult to scan in locations where the relative position of the user may be too close, too far, or at too acute of an angle to scan the item. Stadium banners and billboards are probably too far away and posters above arm level may be at too acute an angle.
- **In locations without adequate light.** If you put a code on an outdoor poster and you want people to use it at night, put it in a well-lit area.

## FIELD TESTING

Field testing your Tags in the environment in which users are expected to discover them is an essential component of a successful project or campaign. Developing and field-testing a proof of concept may represent higher overhead initially, but doing so can save you time and money in the long run.

Make sure to follow the production recommendations in this guide to ensure that your Tag works on the broadest possible range of mobile devices. iPhone and Android may have the most robust digital camera support, but not all of

your mobile audience can be counted on to be using these devices. Make sure to include a representative sample of low-end, middle-end, and high-end phone models when field-testing your Tags. Microsoft is constantly updating the number and variety of devices and platforms that are compatible with Microsoft Tag; see the current list of [supported devices and mobile platforms](#).

## OPTIMIZING FOR MOBILE

Optimizing your web experience for a mobile device is imperative. Your customers will have a more enjoyable and easier time consuming your content if it's designed to be viewed on a mobile device. Mobile device browsers often have different characteristics than desktop browsers have, so it pays to assess how the content delivered by each Tag displays on a wide variety of mobile device browsers. Screen sizes and resolution, too, can vary considerably among different phone models, and these factors can affect the readability of your content in ways that are less predictable than on a desktop or laptop screen. Verify that any important web features work as expected, regardless of the browser or device used. Furthermore, test your content delivered by each Tag under a variety of conditions for a range of different devices, browsers, and operating systems; for example, by limiting the display to text-only content, preventing scripts from running, and other variables.

Keep in mind, too, that video support varies greatly across different mobile platforms and browsers. If your Tag's target content includes a video, we strongly recommend thorough testing to ensure that it downloads smoothly and the video and audio play properly. (In fact, you may want to consider partnering with a mobile video provider who can offer seamless support across different platforms to deliver a great video experience.) Note: It's important to remember that no single video format will play on all supported platforms, so you will need to determine how best to serve your expected audience.

# Information for the User

## USER INSTRUCTIONS FOR DOWNLOADING AND USING THE TAG APP

Because the idea of scanning barcodes with a mobile phone camera is fairly new to most people, Microsoft recommends that you provide basic instructions near each item that explains to users how to download and use the Microsoft Tag app. (There are some exceptions – see "Where and when to display user instructions," below.)

A major benefit of using the Tag solution is that you can provide a single reader for the two major types of 2D barcodes: Tag barcodes and QR Codes, as well as the emerging NFC chip-based recognition technology. This makes using mobile marketing much easier for your customers – and makes tracking your campaigns much easier for you.

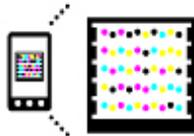
For maximum success, pay special attention to making it easy for users to figure out how to use your materials. We encourage you to lean toward offering user information wherever there's a chance your user won't know how to interact with your materials.

Here are the specific guidelines for providing instructions next to Tag barcodes. These concepts are also appropriate for QR Codes and NFC touchpoints.

- **Location of user instructions in relation to the Tag.** Location of user instructions Instructions for downloading the Tag app should be printed below the Tag barcode, QR Code, or NFC touchpoint.
- **Required:** Do not position any text or other markings within the white border of the Tag barcode. The following are some examples of layout and suggested language for Tag app download instructions:



Get the free mobile app at  
<http://gettag.mobi>



Get the free mobile app at  
<http://gettag.mobi>



Get the free mobile app at  
<http://gettag.mobi>

- **Where and when to display user instructions.** When you use a Tag barcode, QR Code, or NFC touchpoint in a standalone situation, say on a single ad in a magazine or on the back of a product package, always include instructions for downloading and using the Tag app. In other instances you may not need to repeat the instructions by each item. Just use the method that's most likely to be seen by the majority of people seeing your item. For example:
  - If items are located throughout a retail, museum, or attraction environment, you can provide the user instructions on signage located in prominent locations in the store, museum, or attraction.
  - If items are located throughout a catalog, magazine, or other printed material, you can provide the information in prominent locations — say on the table of contents page, masthead, or near major section heads, instead of next to each item.
  - **Required:** If your items are used as part of a video, the user instructions must be presented at the beginning of the video content, instead of every time that an item is displayed. The Tag app URL (<http://gettag.mobi>) must be displayed as part of the video.
  - If items will be delivered directly to another person, such as on a business card, you may provide the information on the reverse side of the printed material.
- **Keep in mind:** Because recognition technologies are still entering mainstream use, it's much better to lean toward providing ample and frequent user instructions. Watch carefully during field testing to make sure everyone who uses one of your items knows what to do. If they don't, add the instructions.

## CUSTOMIZING USER INSTRUCTIONS FOR DOWNLOADING THE TAG APP

When you use Tag Manager to create and download a Tag barcode, QR Code, or NFC URL, you're given the opportunity to include user instructions in the design, as shown above. These standard instructions for downloading the Tag app ("Get the free mobile app at <http://gettag.mobi>") have been shown to be effective, but you can also write your own instructions in the style and wording that suits your audience and business objective. Keep your wording short and clear, and make sure that your instructions accurately direct the user to the free Microsoft Tag app download service: <http://gettag.mobi>. For usage and placement of customized user instructions, please follow the User Instructions for Downloading the Tag app.

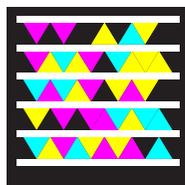
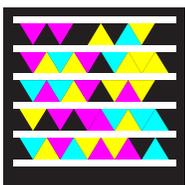
### Promotion of Services Related to Creating Tags

If you use the Microsoft Tag Web Services API to create Tag barcodes, QR Codes, or NFC URLs on behalf of other third parties, you may not promote any of your products or services in association with the API, Tag Manager web service, or scannable items in a way that would make the ownership of the API, Tag Manager web service, or Microsoft Tag recognition technologies confusing to the user. Third parties should not associate their product name or reference their service in close proximity to items created using the Microsoft Tag API service. The items should be standalone and not adjacent to any branding but Microsoft Tag. Below the user instructions for downloading the Tag app, however, third parties can include plain text that promotes their services used to create Tag solutions, but any related services should reference the "Microsoft Tag" or "Tag" product name. See the "Correct" example, below, for an illustration of proper usage:



INCORRECT

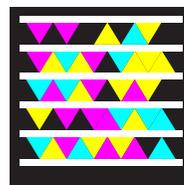
Third Party  
Brand/Service



Third Party  
Brand/Service



CORRECT



Get the free mobile app at  
<http://gettag.mobi>

This Tag was created using  
<3rd Party Service Name>

## RELATED CONTENT

The content that is published next to the Tag barcode, QR Code, or NFC touchpoint should be reasonably related to the context in which the item is published or printed. For example, the content associated with a Tag barcode printed on a movie poster should reasonably relate to the movie or some aspect of the movie.

### *General guidelines for related content:*

- **Set user expectations.** Your content should explain to users in advance what scanning the item will do. Will scanning your Tag barcode open a web session on the phone? Will it dial a phone number? Will it download information onto the phone, and if so, what information? A movie poster, for example, might say: "Scan the Tag to view a behind-the-scenes look at the making of the movie," or "Scan the Tag to get \$2.00 off your movie ticket."
- **Location of content in relation to the item.** If content is printed with the barcode or touchpoint, we recommend that the description of what the item does should be printed above or to the left of the item. (User instructions for downloading the Tag app should be printed below the Tag barcode, QR Code, or NFC touchpoint.) (Required: When using a Tag barcode or QR Code, do not position any text or other markings within the white border of the Tag.)
- **Type font and type size.** You can use any font to display related content. (The default font is Arial.) You can use the type style that matches your brand messaging, if you wish. There are no restrictions against boldface or italics, but keep in mind that legibility is key.



*Tag in print showing Tag content and user download instructions.*

# Creating Tag's Recognition Technologies

Creating a Tag barcode, QR Code, or NFC URL is fairly straightforward. The first time you visit the Tag Manager web service, you will be prompted to create a free user account. You can sign in with your Windows Live username and password. (Sign up for a free Windows Live account [here](#) or on the Tag Manager sign-in page.) Once you have signed in, the Tag Manager page will be displayed. This is where you select and create your recognition technology, prepare files for production in other formats, and edit them as necessary.

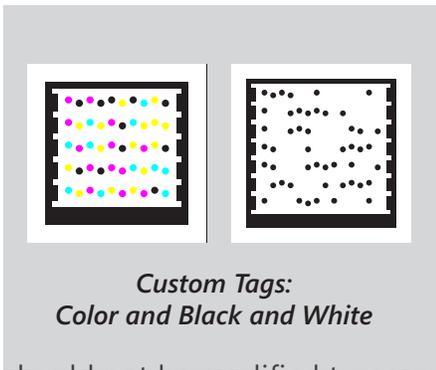
## GENERAL DESIGN GUIDELINES



Tag barcodes and QR Codes are generated in vector graphics format so that they can be infinitely scaled from small to large yet maintain a crisp visual appearance. Standard Tag barcodes use a space-efficient set of color or black-and-white

triangles. The symbol rows are separated from the frame and from one another by row spacers. The black frame is enclosed in a white border, equal in width to the height of the black bottom bar. See "[About Tag Borders](#)" for more details.

The number of symbol rows depends on the Tag barcode type. Standard color Tag barcodes have five symbol rows, whereas standard black-and-white versions have seven. Regardless of type, Tag barcodes always have twice as many symbols per row as they have rows. So, standard five-row color Tag barcodes will always have



10 symbols per row. Standard black-and-white Tag barcodes will always have 14 symbols per row.

For custom Tag barcodes, however, the symbols can be color or black-and-white dots.

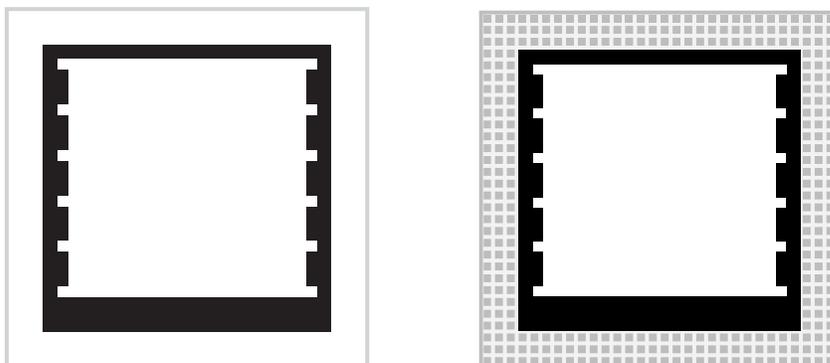
QR Codes have a standard set of lines and circles to create their design. Their design

should not be modified to ensure scannability; use a custom Tag barcode if you would like to change the color or add images or text to the background of your barcode.

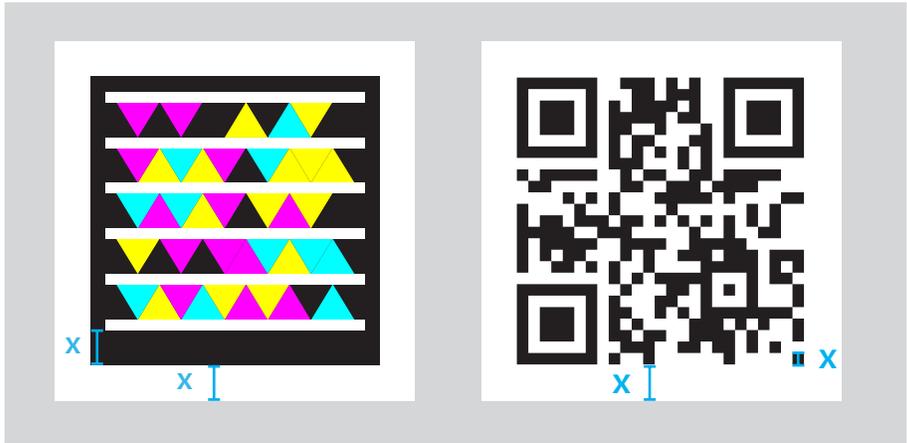
NFC touchpoints don't require any kind of visual cue to function. However, we recommend that you include the helper instructions to indicate to your customers that your materials are interactive with their NFC-enabled phones. As of this writing, the number of NFC-enabled devices in market is relatively few, so we recommend pairing your NFC touchpoint with a Tag barcode or QR Code to ensure that the maximum number of your audience can engage with your content.

### About Tag Barcodes and QR Code Borders

The border is an integral part of the Tag barcode and QR Code design that must not be customized, obscured, or changed in any way. The border includes the white area around the Tag barcode or QR Code (shown at left below; note that the white border is the same width as the height of the bottom black bar) as well as the black border and the timing markers – including the white bars at the top and bottom and the small white squares on each side of the Tag barcode frame. The second image (at right below) shows the specific areas (in gray) that cannot be changed or removed. Any design changes in these areas may make the Tag barcode unscannable by the Tag app.

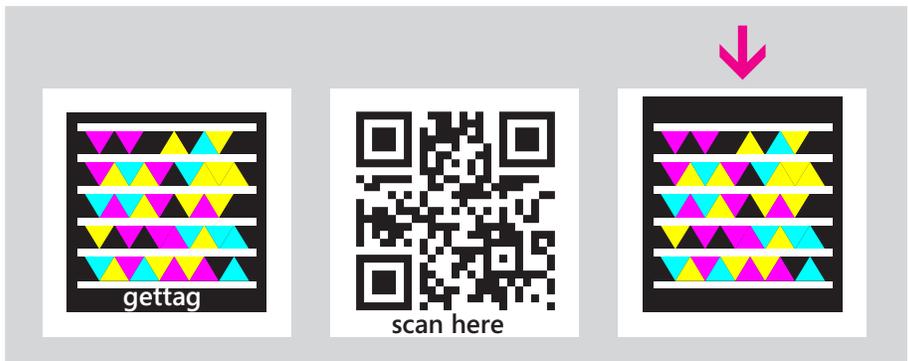


**Remember:** The width of the white space around any Tag barcode and QR Code is equal to the height of the bottom black bar, as shown:



The following example shows the black horizontal bar or white border improperly modified with text or an arrow:

 **INCORRECT**

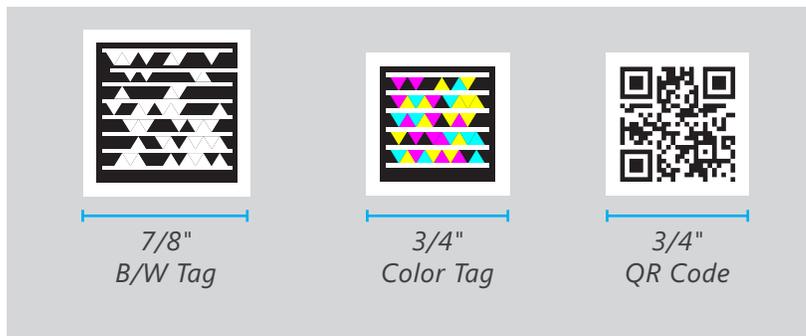


## Minimum Size for Standard Tag Barcodes and QR Codes

The following minimum sizes have proven to work well with a wide range of camera phones. Note that these minimum size requirements include the white space around the Tag barcode.

### *Standard Tags*

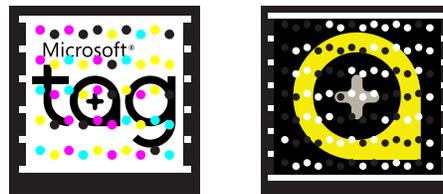
- Standard color five-line Tag barcodes and black-and-white QR Codes must be printed or displayed at a size of at least 3/4 inch x 3/4 inch.
- Standard black-and-white Tag barcodes must be printed or displayed at a size of at least 7/8 inch x 7/8 inch.



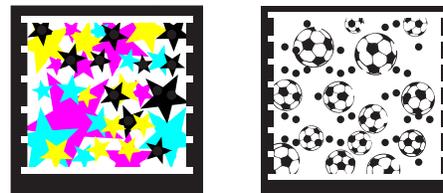
# Creating Custom Tag Barcode Images

To provide a wide variety of branding and creative opportunities, Tag barcodes are customizable. You can modify the design to suit your individual and business goals. Note: Microsoft Tag supports customization of Tag barcodes saved in .wmf and .pdf formats. Microsoft PowerPoint® supports .wmf files, but does not support .pdf files. Tag barcodes saved as .pdf files as well as .wmf files can both be customized using Adobe Illustrator.

The "Quick and Easy" approach lets you customize Tag barcodes by using dots instead of triangles and replacing the background with an image. For example:



Using the "Advanced Design" approach, you can create more intricate designs by integrating symbols and other design elements that disguise some or all of the dots. For example:



Either type of customized image can be rendered in color or black and white.

**Note:** The minimum size of a customized Tag barcode is a 1.25-inch square, including the mandatory white border.

Both design approaches start with creating a standard Tag barcode (URL, Free Text, vCard, Dialer, or App Download). See [Creating Standard Tags](#).

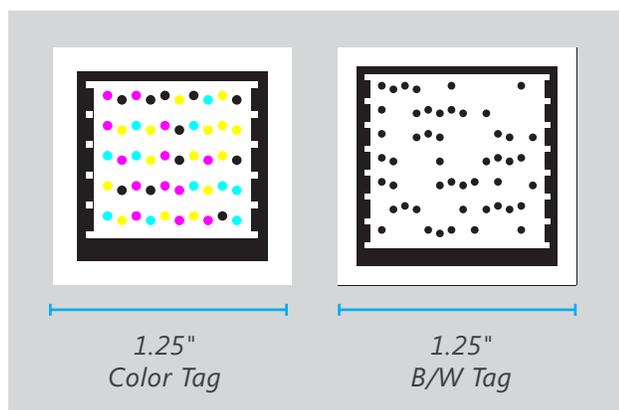
## Opacity

In designing color and black-and-white Tag barcodes with a custom background image, opacity is an important consideration. Scannability can vary significantly, depending on the device used, but the following minimum opacity levels for the Tag barcode dots are recommended for successful scanning across a broad range of device models and quality levels:

- **Custom color Tags:** opacity set to a minimum of 40 percent
- **Custom black-and-white Tags:** opacity set to a minimum of 50 percent

## Minimum Size for Custom Tag Barcodes

The minimum size for customized Tag barcodes, whether rendered in color or black and white, is 1.25 inch x 1.25 inch. This minimum size has proven to work well with a wide range of camera phones.

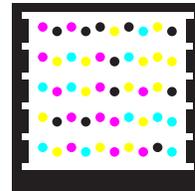


## THE "QUICK AND EASY" APPROACH

Remember that Microsoft Tag only supports customization of Tag barcodes saved in .wmf and .pdf formats. Microsoft PowerPoint supports .wmf files, but does not support .pdf files. Tag barcodes saved as .pdf files as well as .wmf files can both be customized using Adobe Illustrator, however.

1. Open the Tag Manager.
2. Create a standard Tag.  
**OR**  
Select an existing Tag to customize from the Manage Existing Tags table.
3. In the Tag list, click the Download icon for the Tag that you want to customize. The Download dialog box will appear.
4. In the Download dialog box, Select Custom.
5. In the Render dialog box, use the File Type drop-down menu to do one of the following:
  - Select wmf to customize the Tag using Microsoft PowerPoint;**OR**
  - Select wmf or pdf to customize the Tag using Adobe Illustrator.
6. Specify the size of the Tag as equal to or larger than 1.25 inches.
7. Click Download.
8. Save the rendered Tag.

The resulting custom Tag barcode, like the one pictured above, uses a matrix of color or black-and-white dots, as opposed to the color or black-and-white triangles of standard Tag barcodes. A custom Tag barcode can be used as-is, or it can be further modified in a several ways, as described in the following sections.



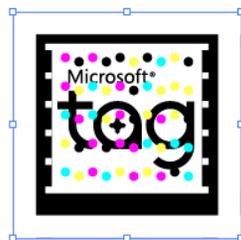
## Replace the Background Image

Once you've created and saved a custom Tag barcode, you're ready to add your own background. Here are steps for using Microsoft PowerPoint® or Adobe Illustrator to customize the background of your Tag barcode.

**Note:** You may find this short video (3 minutes, 7 seconds) on [customizing Tag barcode images with Microsoft PowerPoint](#) a helpful introduction.

*To add a background image with PowerPoint:*

1. Launch PowerPoint.
2. Create a new presentation.
3. Click the Insert tab in the ribbon.
4. In the Images group, click Picture.
5. Browse to and select the background image you want to use with your Tag barcode, and then click Insert.
6. Click the Insert tab in the ribbon again.
7. In the Images group, click Picture.
8. Browse to and select the custom Tag barcode image file, and then click Insert.
9. Right-click the custom Tag barcode image.
10. On the shortcut menu, click Bring to Front.
11. Resize, crop, and position the background and custom Tag barcode image so that the background fits inside the Tag barcode area. Make sure to maintain the white space around the perimeter of the Tag barcode. For more information, see "[About Tag Barcode Borders](#)".



12. Draw a box around the images to select both of them, as shown:

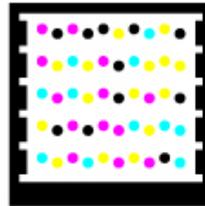
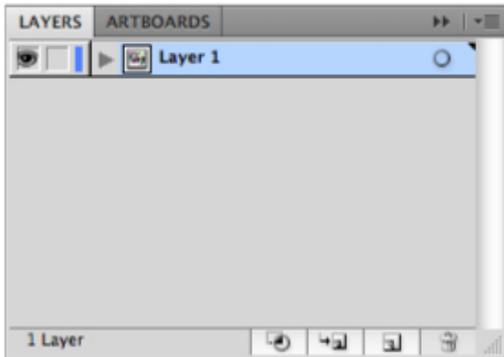


13. With both images selected, click the Format tab in the ribbon.

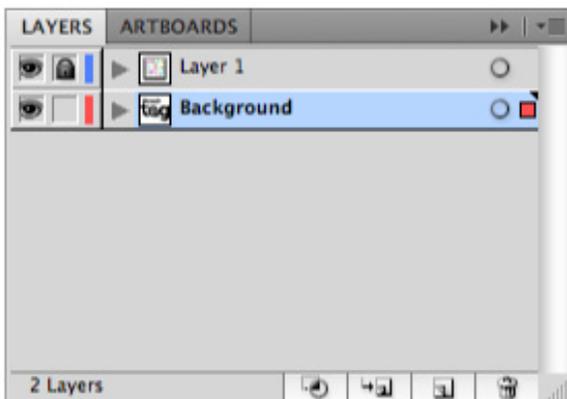
14. In the Arrange group, click Group.
15. In the drop-down menu, click Group.
16. With the grouped image still selected, right-click the image.
17. On the shortcut menu, click Save as Picture.
18. Name the image and save it as a .jpg, .gif, .png, or .wmf file.

*To add a background image with Adobe Illustrator:*

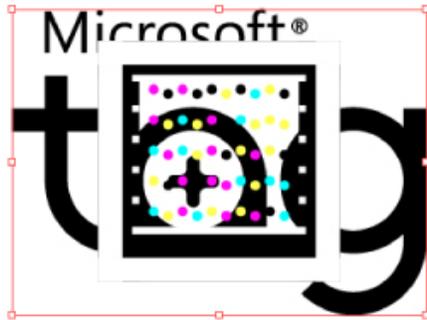
1. Start Adobe Illustrator and open the Tag barcode image.
2. Rename Layer 1 to "Tag."
3. Create a new layer for the background image and name it "Background."



4. Drag the Background layer so that it is beneath the Tag layer, and then lock the Tag layer.



5. Click the Background layer bar to make Background the active layer.
6. On the File menu, click Place.
7. Select the image you want to use as the background image, and then click Place.



Resize, crop, and position the background and custom Tag image as needed to make the background fit inside the Tag area. Make sure to maintain the white space around the perimeter of the Tag. (For more information, see ["About Tag Barcode Borders"](#).)



8. Save the Illustrator file.
9. Save the Tag as a file:
  - On the File menu, click Export to save the Tag in .jpg, .gif, .png, or other image format.
  - On the File menu, click Save As to save the image in .pdf or other file format.

## ADVANCED DESIGN GUIDELINES

Follow these design guidelines to create custom images that can be read reliably:

- Preserve the Tag barcode borders. Remember that the image border is a part of the Tag barcode that must not be customized, obscured, or changed in any way.
- Design for the color dots.
- Replace or integrate your Tag barcode's color dots with design elements of the same color family, and in equivalent location.
- Maintain the hue of the original color dots. You have some flexibility to work within a range of saturation and brightness within that hue (see [Hue Ranges](#)).

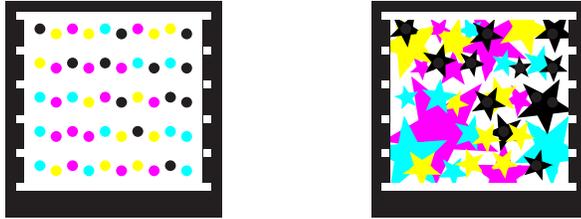
### Replacing the Color Dots (the “Advanced Design” Method)

Once you have created a custom Tag barcode, you can use an image editor to replace the color dots with other imagery or symbols, or you can incorporate the color dots into surrounding design artwork. To create a reliable customized image, you may disguise the existing color dots with an original design of your choice, but the position of the existing dots must be maintained. The hue of the custom design elements must match those of the dots they replace, though there is some flexibility in the range of saturation and brightness within each hue (see ["Hue Ranges"](#)).

*To incorporate the Tag dots into your design*

1. Start your image editor application and open the custom image file you've created for this purpose.
2. Create a new layer for the new symbols or design elements. Make sure this layer is above the custom Tag barcode image layer.
3. Create new symbols or design elements for each color dot (or group of dots), adhering to the location and hue requirements described below for the color dots in your custom Tag image file.
4. Disguise the colored dots in the custom Tag image using your custom design elements.
5. Save your customized Tag barcode.

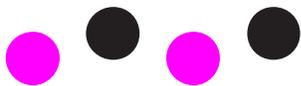
The figure below is an example of how you can replace the color dots with other design elements while maintaining the hue and location of the original color dots. The stars are carefully positioned to cover the original color dots and match their hue



Notice, also, that within the Tag barcode frame you can use any design element of any color in the areas not occupied by the color dots; apart from covering the original dots and matching their color and location, the stars are otherwise purely design elements with no additional functional relation to the original pattern of color dots.

Depending on your design, you can replace the color dots one by one with other design elements. You can also have a larger design element replace multiple color dots. The first image shows two magenta dots and two black dots, which are then individually covered by stars of the same color.

*Original Tag Image (Detail):*



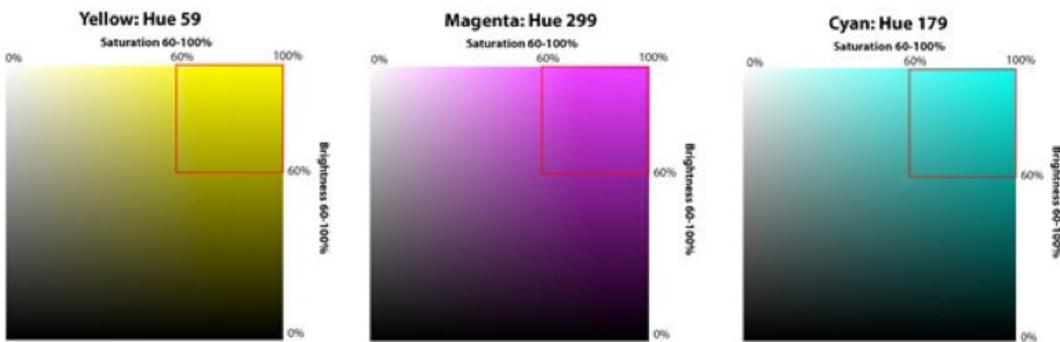
*Customized Tag Image (Detail):*



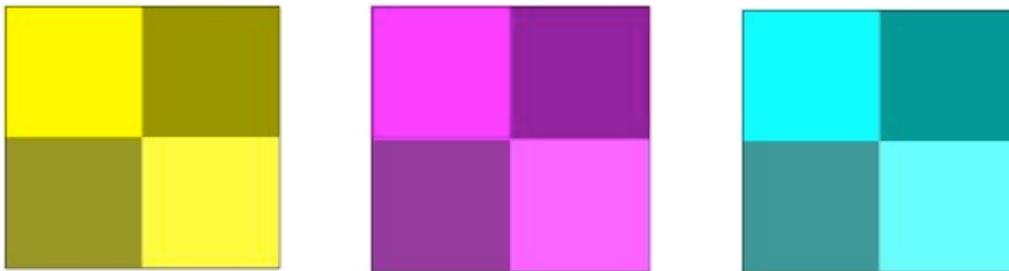
Make sure that the center of the original color dot is entirely enclosed within the new design element, as shown in the detail image above.

## HUE RANGES

Hue, saturation, and brightness (HSB) values are used to describe the relationship among colors. By using HSB values, you can ensure the color hues you use in your custom images allow the Tag barcode to be scanned reliably. The Microsoft Tag app can work within a range of brightness and saturation values for a color dot hue to provide more creative flexibility in the design. Inside the Tag barcode frame, you can use any design element of any color in the areas not occupied by the color dots. In the figure below, the red squares indicate the acceptable range of saturation and brightness for each of the non-black color hues. There is also some flexibility regarding the black dots under certain conditions; see [Color Replacement](#).



The color areas shown below illustrate the dynamic range of saturation and brightness for each of the three color hues.



Make sure that the brightness and saturation of your design elements are within the acceptable range.

## COLOR REPLACEMENT

Tag barcodes created using Tag Manager can show considerable resilience to color changes without significant loss of scannability in many cases. Changing the hue of the triangles in a standard Tag barcode or the dots in a custom image – to more closely match a company logo or the color palette of a marketing campaign, for example – may be possible. Of course, as with all Tag barcodes, you should thoroughly field-test to verify that any modified versions will scan reliably.

Our tests demonstrate the following results with regard to color substitution:

*Change key black to another color. The results for replacing black with another color differed by Tag barcode type:*

- **Standard color:** On most devices, the Tag app was able to scan a Tag barcode when black is replaced with another color.
- **Standard black-and-white:** The Tag app on all platforms was able to scan a Tag barcode when black was replaced with a different color.
- **Custom color Tag barcode:** The Tag app on most devices was able to scan a custom color Tag barcode when black is replaced with another color.
- **Custom black-and-white Tag barcode:** The Tag app on most platforms failed to scan a custom black-and-white Tag barcode when black is replaced with another color.

*Change white to another color. The results for replacing white with another color differed by Tag type:*

- **Standard color:** The Tag app on all platforms was able to scan a Tag barcode when white was replaced with another color.
- **Standard black-and-white:** The Tag app on all platforms failed to scan a Tag barcode when white was replaced with another color.
- **Custom color Tag barcode:** The Tag app on most platforms was able to scan a Tag barcode when white was switched to another color.
- **Custom black-and-white Tag barcode:** The Tag app on most platforms failed to scan a custom black-and-white Tag barcode when white was switched to another color.

*Change yellow, magenta, or cyan to another color. Replacing one color with another color on a Tag produced varied results:*

- **Yellow to magenta:** When yellow is switched to magenta, when magenta is also a color in the Tag barcode, the Tag app on all platforms will not scan regardless of Tag type.
- **Yellow to another color:** The Tag app on all platforms was able to scan a Tag barcode when yellow was replaced with a different color.
- **Magenta to another color:** The Tag app was able to scan a Tag barcode when magenta was replaced with another color.
- **Cyan to another color:** The Tag app was able to scan a Tag barcode when cyan was replaced with another color.

Note: QR Codes should remain black-and-white to ensure they will reliably scan.

## COLOR INVERSION

When the colors of a Tag, regardless of Tag type, are inverted, the Tag app, regardless of platform or device, will not properly scan the Tag.

# Displaying Tag Recognition Technologies: In Print, Electronic Media, and Other Surfaces

Regardless of the final medium on which the Tag recognition technologies will be displayed, remember these primary considerations. Pay particular attention to the interference in scan quality that can occur when you put images on rough, reflective, or backlit surfaces, such as cloth, glass, and computer screens. Needless to say, this goes extra for more exotic surfaces such as food:

- **Minimum size.** Note that these minimum size requirements include the white border around the Tag barcode or QR Code.
  - Standard color five-line Tag barcodes must be printed or displayed at a size of at least 3/4 inch x 3/4 inch.
  - Standard black-and-white Tag barcodes or QR Codes must be printed or displayed at a size of at least 7/8 inch x 7/8 inch.
  - Custom Tag barcodes, whether rendered in color or black and white must be printed or displayed at a size of at least 1.25 inch x 1.25 inch.
- **Tag barcode or QR Code borders.** Regardless of the display medium, the white space surrounding the Tag barcode or QR Code image must be equal in width to the height of the black bar at the bottom of the Tag. You must not obscure or encroach in this space, or else the code may not be scannable.
- **Dimensions and relative size.** Ensure that the Tag appears in the correct dimensions and size relative to the anticipated angle and distance from the user.
- **Background.** Ensure that the background material or color on which the Tag barcode or QR Code appears does not interfere with the ability of the Tag app to scan it.
- **Lighting.** Ensure that the environment in which the Tag barcode or QR Code is published has sufficient and compatible lighting for users to scan it reliably.

## TAG BARCODES OR QR CODES IN ELECTRONIC DISPLAYS

This section covers implementation considerations for Tag barcodes or QR Codes that appear in light-emitting media such as televisions, computer monitors and handheld device screens, LED reader boards, JumboTrons, and so on. Displaying codes electronically can potentially reach a worldwide audience.

Electronic media typically emit the necessary light to illuminate displayed Tag barcodes or QR Codes; however, glare or reflections from other light sources in the environment can interfere with a camera phone's ability to scan an electronically displayed code. Moreover, presenting 2D barcodes electronically comes with a share of special considerations because of the wide variety and quality of electronic display devices.

For the most part, the guidelines for printed Tag barcodes or QR Codes also apply to codes in electronic displays. The main consideration for displaying electronic barcodes has to do with variability in the size, type, and quality of video monitors. Tag barcodes and QR Codes display well on LCD monitors, but not so well on cathode ray tube (CRT) monitors. The problem stems not from screen resolution or pixelation, but from variability in dots per inch (DPI) among different monitor brands and models. If you want the 2D barcode to be scannable on every possible video monitor, the Tag barcode or QR Code may end up looking unattractively big on the average screen, while appearing too small to be scanned on monitors with lower DPI.

Also keep in mind that effects from CRT screens are entirely dependent on the imaging system of each camera phone type. The conversion of an image into a digital signal can be entirely unpredictable from handset to handset, even when from the same manufacturer, because of variations in the CCDs (charge-coupled devices) in digital cameras.

Therefore, depending on the CRT screen and the mobile device used, the Tag app may not be able to scan a given Tag barcode or QR Code on a CRT screen. The image captured by the camera phone may be blurry due to the CRT screen interlacing and other factors. As a general rule, assume that the average computer user's screen displays 120 DPI, and then test your Tag barcode or QR Code on a variety of computer monitors. The importance of thorough field testing cannot be overemphasized when it comes to displaying 2D barcodes electronically. Understand that there will be tradeoffs at each end of the CRT screen spectrum.

Beyond that, the main considerations with any Tag barcode or QR Code, electronic or not, is to make sure that the barcode appears in the correct dimensions and size relative to the user; that the barcode border is complete and not clipped; that any image or color behind the custom Tag barcode does not interfere with readability; and that there is sufficient brightness, clarity, and lack of glare or reflection in the display for users to scan the code reliably.

## TAG BARCODES AND QR CODES ON OBJECTS AND IN OTHER MEDIA

This section covers implementation of Tag barcodes and QR Codes displayed on surfaces other than general print media, such as on T-shirts, odd-shaped product packaging, or any other surface that may not have the same light-reflecting qualities as regular print media. Examples might include a Tag barcode stenciled onto a bike, car, or a bus, or printed on a plastic cling-on. 2D barcodes can be printed using an edible confection on the surface of a candy wafer. They can be created using heterogeneous or discrete materials, such as a design of appropriately colored and placed jelly beans, buttons, marbles, or stones. They can be woven or embroidered with fabric and thread. They can be placed on skin as temporary tattoos (see below).

A custom Tag barcode may be "dressed up" so that it doesn't look like a Tag barcode at all, but whatever its form, the Tag must be constructed and displayed in such a way that it can be reliably scanned by the Tag app in the expected environment. In addition to the guidelines described previously, pay close attention to – and test for – required border, angle and surface curvature issues, color accuracy, and environmental lighting.

## TAG BARCODES OR QR CODES AS TEMPORARY TATTOOS

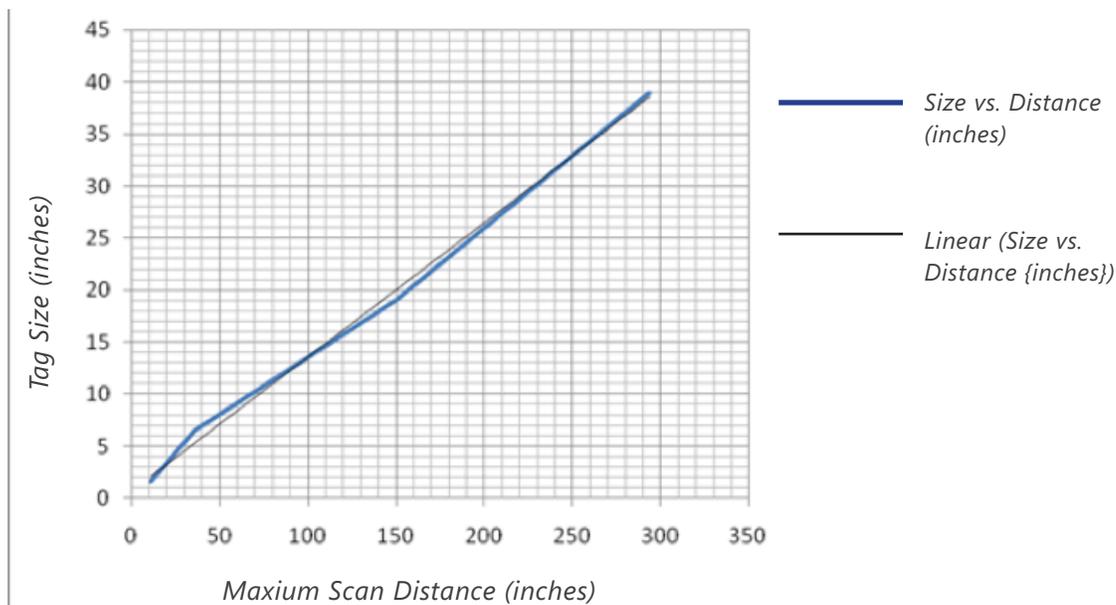
Temporary tattoos are a unique item for events, products, and entertainment. If you choose to create temporary tattoos, there are some specific considerations to keep in mind. To make a temporary tattoo out of a standard or custom Tag barcode or QR Code, you will have to print the image in reverse using the same process as for other temporary tattoo pictures. The image can be reversed during the design stage in PowerPoint or Illustrator, or using reversed-image capabilities at the printing stage. However, **a reversed Tag barcode or QR Code cannot be scanned**, and some users may want to scan the 2D barcode without applying the tattoo. It's a good idea to include a regular printed image of the barcode on the back of the sheet of paper along with the user information and instructions.

There is also a diversity issue to consider if you create temporary tattoos. For example, the background color of the user's skin may affect scannability. If the skin is dark and the Tag barcode or QR Code has no white border, it will not be scannable. You must include a white background and border (rather than a transparent one) to avoid potential problems.

Moreover, tattoos of any kind, temporary or not, may be viewed negatively in some cultures and by some social groups. A tattoo item may not be successful among users who disapprove of the idea of applying an image to their skin. Make sure to provide an alternative means of displaying the Tag barcode or QR Code – such as with a card or an adhesive sticker – to help avoid cultural sensitivity issues.

## TAG BARCODE AND QR CODE SIZE RELATIVE TO THE VIEWER

As you increase the size of a Tag barcode or QR Code, the distance from which it can be reliably scanned increases. This size-to-distance relationship follows a linear progression as shown in the following graph:



By using this graph, you can extrapolate the straight line to any Tag barcode or QR Code size to determine the maximum distance from which it can be successfully scanned. Based on these results, the safe maximum ratio of distance to Tag barcode size is 7.5 to 1.

Note, however, that distant Tag barcodes and QR Codes must be illuminated enough so that the device's camera can detect it. Also note that the relative

distance and angle of a large 2D barcode might not be uniform for all viewers in large crowd situations (such as a Tag barcode displayed on a JumboTron in a sports arena), so not all of the target audience will be able to scan it.

## ENVIRONMENTAL CONSIDERATIONS FOR TAG BARCODES AND QR CODES

- **Reflections, shadows, and angles.** Strong reflections or shadows on a Tag barcode or QR Code will reduce how reliably it can be scanned. If possible, avoid situations where bright reflections or sharp shadows fall across the image.
- **Behind glass.** Tag barcodes and QR Codes will normally be readable when displayed behind glass, as in the window of a store or in a poster display case. However, try to avoid situations where direct sunlight or bright lighting causes strong glare on the glass.
- **Vertical vs. horizontal display.** Displaying Tag barcodes and QR Codes vertically (for example, on a wall or in a window) reduces the possibility of the camera phone itself casting a shadow across the image. Items placed horizontally (for example, lying flat on a tradeshow table) may be more difficult to scan due to issues with shadows. Bright overhead lighting can exacerbate this issue.
- **Adequate lighting.** Tag barcodes and QR Codes will be hard to read in dark conditions, such as in a nightclub or candlelit restaurant. Moreover, the hue and color saturation of mood lighting, such as strong blue or red lighting at an event, can affect scanning detection. Neutral lighting is best for scanning 2D barcodes.
- **Dots per inch.** Tag barcodes and QR Codes display well on LCD monitors, but they can run into some scannability problems on CRT monitors due to variability in DPI values. Program your display for an average of 120 DPI, and make sure to test your barcode on a variety of computer monitors.
- **Avoid acute angles.** The Tag app is generally very tolerant of skewed angles when scanning Tag barcodes; however, the quality of some camera phones may make it difficult to scan a Tag if the angle of the Tag relative to the user's phone is too acute. The relative distance and angle of a big Tag on a JumboTron, for example, may not be uniform in large crowd situations (for example, fans in a stadium). In such cases, not all of the target audience will be able to scan the Tag. Note that QR Codes generally do not scan well from acute angles, regardless of how minimally the angle is skewed.
- **Avoid acute curves.** As a corollary to the preceding guideline, placing a Tag barcode on a highly curved surface, such as a tube or a ball shape, may distort the Tag too much and make it unreadable. That said, Tags can successfully be displayed on cans, paper cups, and other curved surfaces, provided that all of the

Tag is visible in the Tag app viewfinder at the same time in order to be scannable. QR Codes typically do not scan well on curved surfaces, so a Tag barcode is recommended to ensure scannability.

- **3D.** Think ahead to imagine ways your flat design could end up in a curved deployment. What if you make stickers and then apply them to candy canes? Or, what if your ad is placed too close to the inside edge of a magazine page?

## DESIGN AND USE CONSIDERATIONS FOR QR CODES

The guidelines for designing and presenting QR Codes are similar to those for Tag barcodes. Your choice of design, materials, and display location will all have an impact on scannability. In general, there is an increased element of risk that an environmental factor will make it harder to scan the QR Code, so you need to pay special attention to designing and testing your materials.

Regardless of the final medium on which the items will be displayed, remember these primary considerations:

- **Minimum size.** Although a smaller size may work, ideally, a QR Code should be a minimum of .75" by .75" square.
- **Border.** Just as with the Tag barcode, you need to keep the white border around the QR Code clear of copy or design elements.
- **QR Code borders.** The code needs at least 1/8" border on all sides.
- **Dimensions and relative size.** Ensure that the QR Code appears in the correct dimensions and size relative to the anticipated angle and distance from the user.
- **Background.** QR Codes have to appear on a light background.
- **Lighting.** Make sure there's enough light in the environment where the code will be displayed to ensure reliable scanning.

## DESIGN AND USE CONSIDERATIONS FOR NFC TOUCHPOINTS

Because NFC touchpoints are physical chips attached to or embedded in your content or materials, you'll need to think differently about how to use them. When you create an NFC URL with the Microsoft Tag solution, you'll hand off that URL to the NFC chip provider. They will be able to give you up-to-date advice on the best way to use NFC.

Here are the key considerations to keep in mind as you begin planning an NFC implementation:

- **Audience:** While increasingly prevalent on Android mobile phones, NFC is far out on the bleeding edge of technology adoption. So at this point you'll want to reserve them for use in materials aimed at an Android-centric tech savvy audience.
- **Accessibility:** While a large Tag barcode or QR Code can be scanned from a distance, an NFC touchpoint requires users to get within 5 cm to make a connection.
- **Cost effectiveness:** NFC tags are expected to cost a couple of cents each, making them much more expensive to use than printed barcodes. It's more cost-effective to use them in smaller numbers, say a limited direct mail campaign or semi-permanent locations such as posters, exhibit labeling, and way-finding applications, such as city guides.
- **Durability:** Typically, a user will be tapping the NFC touchpoint with their mobile phone, so plan for your materials to be sturdy enough for regular handling. That means heavier poster paper or even permanent attachment to exhibit signs and other objects.
- **Discoverability:** Because the user doesn't actually scan an image, it's critical to give a visual indication that the material contains a sensor, and where it is. Using standard visual clues such as the image shown in the User Instructions above is critical to a successful implementation.
- **Unique advantages:** While NFC presents a number of constraints, there are a few excellent reasons to use them. Users can interact with an NFC-enabled object in a more natural way, by simply tapping it or waving their phone nearby, rather than physically scanning an image. In addition, NFC touchpoints aren't affected by production issues such as reflections, poor lighting or, within reason, placement on irregularly shaped objects.

We recommend that you add a marker to your image to denote for your customers that it's NFC-enabled. Three radiating lines are commonly used in the market today to indicate physical materials are enabled with an NFC touchpoint.

We also recommend that you pair a Tag barcode or QR Code with an NFC touchpoint to ensure that a broad audience can engage with your content. Below is an example of 2D barcodes with the three radiating lines to denote that the materials are interactive either through scanning the barcode or tapping the NFC touchpoint.



## A FINAL WORD:

Following the suggestions in this guide should help ensure your recognition technologies work well. We've said it a few times already in this guide, but it's worth repeating: always make a few proof-of-concept items and field-test them under the same real-world conditions in which your target audience is expected to encounter them. We want your campaign to be as successful as possible, so please, take the time and effort to do this step.

# Technical Support

If you encounter any issues or have additional questions about creating or implementing Tags, please visit [Microsoft Tag Resources](#) or contact [TagSupp@microsoft.com](mailto:TagSupp@microsoft.com).