Determining Arabic Typefaces Suitable for Flexible Packaging Printed by Flexography

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Abstract:

The most common printing technique today in packaging printing is flexography especially in plastic packaging. The effective factors for selecting the typeface and the size required in order to get high quality are readability and legibility. The problem is most consumers can't interpret some perceivable messages or information about a product because of non-compatible typefaces variables printed by flexography printing. Having a reference guide for Arabic fonts with suitable sizes for printing on flexible packaging using flexographic printing is very important for producing and exporting to Arab countries. The objective of the research is to determine the suitable Arabic typefaces and its size to print the text by flexography. Different typefaces and size of Arabic text are printed by flexography on 12 micron PET film that can be used as a monolayer or as a laminating packaging material. The results of the study indicate that: All Arabic typefaces were unreadable in 2 pt. size in both positive and reversed styles. The best positive Arabic typefaces in 3 pt. size were AXT Advertising Light, AXT Advertising Bold, and AXT Simplified Light. Most Arabic fonts were readable in 4 pt. size except Axt Manal and Axt Manal Black in both positive and reversed styles. Starting from 5 pt. font size is considered ideal in readability and legibility in both positive and reversed styles except with reversed Axt Manal font.

1. Introduction

A good package can properly communicate a product for better comprehension. Design and marketing personnel expose product contents through such visual elements as word, graphics color, trade mark, shape, size, and texture (DiFranza JR, Clark DM, Pollay RW, 2002).

The visual elements of packaging design influence consumers' decision and choice as it has become an advantage in competition. Packaging can attract consumers' attention, transform the message of the product, impress consumers with the image of the product, and distinguish one product from another (V. Butkevičiene, J. Stravinskiene, A. Rūtelione, 2008).

Typography lies at the heart of packaging design because it is essentially concerned with the dissemination of information. Products have names, descriptors, uses, benefits, variants, ingredients, components, instructions, safety warnings, customers care information, and ownership details. All of these details need to be displayed on the pack in a legible manner to enable consumers to read and understand the information they are looking at.

The modern typographer is faced with a bewildering array of typographic choices. Pick up any font library catalog and find a huge selection of typefaces to choose from.

The designer's skill lies in matching typeface selection to function. Initially, the designer's task is to select a typeface that will display on-pack information in an easy to read format. Selection is determined by factors like pack size, information extent and printing methodology (Giles Calver, 2004).

So using text information is needed where wanting to avoid the misinterpretation of the message. Typography can be understood as the visual interpretation of verbal language (Matthias Hillner, 2009).

The problem of the research is most consumers can't interpret some perceivable messages or information about a product because of non-compatible typefaces variables printed by flexography printing.

Legibility and readability relate to the ease and clarity with which one reads type, they actually refer to two different things: legibility refers to the actual design of the typeface, while readability refers to how the typeface is set.so are the common Arabic fonts used in flexible packaging printing suitable in its readability and legibility for interpreting the information for customers easily? This is the research question that we try to answer. Factors affecting type's readability include size, leading, line length, alignment, letter spacing, and word spacing. So it follows that a legible typeface can be made unreadable by how it is set, while a typeface with poor legibility can be made more readable with these same considerations (Ilene Strizver , 2006).

This study aims to find out reference guide for Arabic fonts with suitable sizes to print on flexible packaging using flexographic printing.

2. Literature Review
2.1 Arabic Alphabet
The origin of the Arabic script goes back to the first alphabet created by the Phoenicians. The Phoenician alphabet is the mother of both Latin and Arabic scripts.

The Arabic Alphabet consists of 29 consonants and 11 vocalization marks in the shape of accents. The structure of the alphabet has only 19 basic shapes, figure (1). However, since the letters change their shape according to their position in the word initial, medial, final, or isolated then the set of glyphs will add up to 106: 23 letters have four alternative shapes, and 7 letters have two alternative shapes. If we add the two indispensable ligatures of Lam-Alef, then the number will be 108. Finally, since the Arabic alphabet is also used in some non-Arab languages, more alterations to the letter were introduced to represent all the additional non-Arabic phonetics that brings the number of glyphs up to 130. Moreover, the number of glyphs can further increase if we also count all kinds of combinations within the letters if the typeface needs to fully mimic the calligraphic handwritten Arabic script. So according to each typeface, the number of glyphs can start with 130 and end in the hundreds.

The following image, figure (2) shows the four developing layers of the Arabic script. The first line shows only the basic shapes of the letters. The second line illustrates the added diacritic dots on some letters that require it. The third line adds the vocalization marks for better pronunciation. The final line shows a decorated sentence where some decorative elements were added to the script to make it more elegant or holy (History of Arabic Type Evolution from the 1930′s till present, 2007).
2.2 Recognizing Attributes of the Flexographic Printing Process

The use of spot colors, specialty inks, and a wide variety of substrates are just a few of the choices available with flexography. Designers must be informed about the advantages of the flexographic printing process in order to make use of them during the prepress. The designer must communicate with the print provider to understand their capabilities and how they can jointly optimize the quality and effectiveness of the final product (Star Packaging Corporation, 2012).
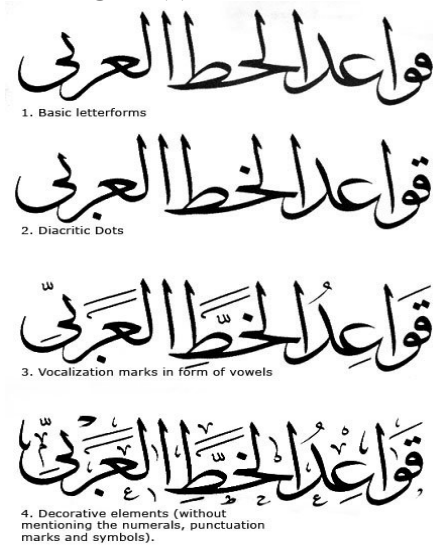

Figure (1): Arabic letters

Figure (2): Arabic script

2.3 Type Preparation for Flexographic Printing
Positive text
For best results, small positive text should be created from one solid color. Screened text can be difficult to read, and slight misregistration on press can affect the legibility of text that is created using more than one color (Star Packaging Corporation, 2012).

Reverse text
Small type size may fill in and not be legible when printed. It is not recommend to use light-style fonts or serifed fonts for reversed-out text, as the thinner portions of the letters will have a tendency to fill in. Type should never reverse out of more

than one color. Figure (3) shows reverse Arabic text.

Figure (3): Reverse text

Due to the nature of the flexographic process, text that prints positive will tend to fatten while text that is reversed out will tend to fill in, lose fine lines and serifs, and become plugged. Therefore, when selecting fonts, care and attention is critical. When attempting to increase the weight of a serif font, it is not always effective to use the bold, heavy, black, or ultra-versions.

PostScript/Type 1

A PostScript font is a Type 1 font and is created from two components: a printer font and a screen font. The printer font contains the outlines that allow the output device to accurately render the font in any size. The screen font allows the font to be viewed on a computer screen (monitor). Type 1 fonts require both pieces to work properly. PostScript fonts are the de-facto standard for professionals in the creative and print environments (Flexographic Technical Association, 2013).

OpenType Fonts

OpenType is a font technology essentially co-developed by Microsoft and Adobe which allows the creation of 'rules' (or features in the OpenType terminology, indicated by 4-letter tags) inside the font. The idea behind OpenType is that the font designer is the best person to determine how the font should behave. OpenType does not deal with the design of the glyphs of the font, but rather with how these glyphs can interact with one another (Ste'phane Boeuf , 2011)**.**

There are several advantages to the OpenType format. First, as with TrueType, the entire font is housed in a single file. Second, this file is cross platform – the same file can be used on a Mac or Windows platform with consistent results. Third, an OpenType font can contain either PostScript or TrueType outline data. Lastly, OpenType can support Unicode information, which can contain thousands of characters including high quality ligatures, swash glyphs, and other advanced typographical features. This is a significant benefit over PostScript Type 1.

Sometimes downstream companies (such as prepress providers and printers) working on a

design file may not have easy access to fonts used. If so, the design firm (or whoever is creating the content) should convert these fonts to outlines or paths. A common practice for handling type is to convert type to outlines in order to prevent font problems and lock content. However, this makes the text no longer editable and may alter its appearance, figure (4). When converted to outlines, small type may appear heavier and should be reviewed prior to the final conversion.

When a file with outlined type is supplied, it is advisable to also send a copy of the original file, including fonts, prior to outlining the type.

Electronic files (.ai, .eps, .psd) containing text that are to be placed in another document, should also have all text converted to outlines. Fonts in placed images often are not reported as missing until the file is RIPed. Converting fonts to outlines helps identify poorly written or corrupt fonts(Flexographic Technical Association, 2013).
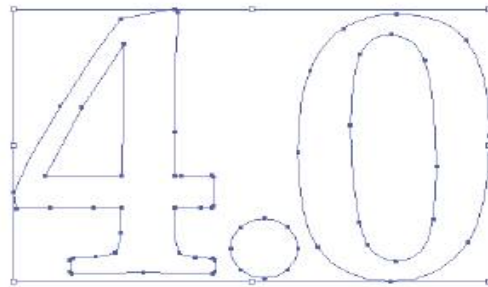
Figure (4): Converting type to outline

Styles of Fonts

In some applications, there is a style menu with type attributes such as bold, italic, outline, shadow, small caps, and all caps. Using this feature is not advisable. It is recommended to use only the actual font, such as Times Bold, rather than Times with the bold attribute.

When using attributes, results vary depending on the RIP, printer drivers, and application being used. Selecting style attributes usually creates a pseudo version of the typeface, which is a degradation from the original font design. Many newer RIPs, printer drivers, and applications ignore pseudo commands and simply use the plain printer font. For example, if the italic command from the style menu is selected for Humanist 541 Condensed Bold (which has a corresponding printer font), the font will display as a condensed bold italic on screen but will typically not print in italics.

Outline Effect

To create an outline only, the designer can use a vector program and gives the type a stroke in the desired color and a fill of 'none' or 'white', figure (5). To stroke only the outside, he can use also a copy of the type with no stroke and a white fill exactly on top of the stroked copy. Be sure the

stroke is at least twice the specified image trap for the applicable print segment (Flexographic Technical Association, 2013).
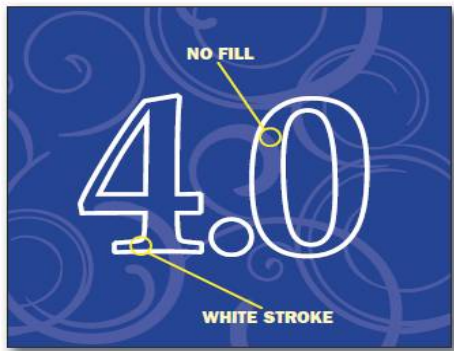

Figure (5): Outline letters

3. Problems of Arabic fonts printed with flexography

Some of Arabic fonts problems as follows:

Arabic fonts problems

1. Printing small text on screen background deform the details of the letters, figure (6).

Figure (6)

2. Unsharping of the reversed letters outline due to the misregistration of the component colors, figure (7).

Figure (7)

3. Bad trapping of solid letters on halftone background, figure (8).

Figure (8)

4. Ghosting of reversed letters with solid background, figure (9).

Figure (9)

5. Ghosting of reversed letters with halftone background, figure (10).

Figure (10)

6. Deformation of reversed letters with solid background due to plate wear, figure (11).
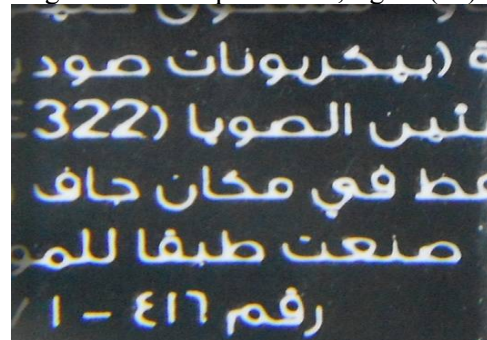

Figure (11)

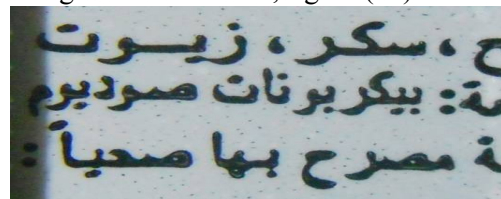7. Filling of Arabic letters, figure (12).

Figure (12)

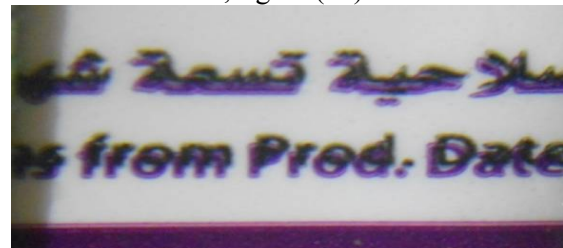8. Misregisteration of solid Arabic letters printed with two colours, figure (13).

Figure (13)

4. Methodology

The following section describes the effect of the flexographic printing process on the selection the

suitable typeface of Arabic fonts and the printed minimum size performed the legibility and readability**.** To fulfill that a test form was printed contains gradual sizes and different Arabic fonts, figure (14). After printing the form, it was analyzed for Verification from legibility and readability of fonts.

4.1 Materials and Methods

The test form was printed on Hemingstone Stack Type flexographic Printing Machine that has 6 printing units, the film width 1300mm and printing width 1050 mm,the speed used 100m/min. the type of Anilox roll is ceramic roll equipped with a doctor blade chamber its line screen 360 lpi, cell volume 3.6 BCM's. The type of ink is nitrocellulose ink ,its viscosity 18 sec / Ford cup. The type of printing plate is nyloflex ACE Digital from FlintGroup, its thickness 2.54 mm and hardness 62 shore A. The adhesive tape of plate from Tesa, its thickness 500 microns and medium type. All tests were performed on PET film, 12 micron.

Pre-survey was done in prepress companies to determine the common Arabic fonts used in the Egyptian packaging market. These fonts are used in the test form.

The test form contains ten Arabic fonts in gradual sizes 2, 3, 4, 5, 6, 8, 10, and 12 pt. with positive and reversed typefaces . Text contains letters, numbers, and some glyphs. Fonts used are Axt Gihan Light, Axt Gihan Bold, AXT Advertising Light, AXT Advertising Bold, AXT Simplified Light, AXT Simplified Bold, GE SS Text Light, GE SS Text Bold, AXT Manal, and AXT Manal.

A survey was done with 50 consumers to determine the readability and legibility of the printed Arabic text. The acceptance percentage of the readability and legibility of the fonts is shown in table (1).

4.2 Results and discussion

Investigation for readability and legibility was done to determine the suitable typefaces and sizes for flexible packages**.**

Results are shown in table (1). Axt Gihan Light font was unreadable in 2 and 3 pt. sizes, figure (15). Axt Gihan Bold font was unreadable in 2 and 3 pt. sizes and numbers and glyphs were unreadable in reversed typeface with 4pt. size, figure (16).

AXT Advertising Light font was unreadable in 2 pt. size and was unreadable in reversed typeface with 3 pt. size, figure (17). AXT Advertising Bold font was unreadable in 2 pt. size, and numbers and glyphs were unreadable in reversed typeface with 3 pt. size, figure (18).

AXT Simplified Light font was unreadable in 2 pt. size and was unreadable in reversed typeface with 3 pt. size, figure (19).

AXT Simplified Bold font was unreadable in 2 pt. size and numbers and glyphs were unreadable in both positive and reversed 3 pt. size, figure (20).

GE SS Text Light font was unreadable in 2 and 3 pt. sizes, figure (21). GE SS Text Bold font was unreadable in 2 pt. size and numbers and glyphs were hardly readable in both positive and reversed 3 pt. size, figure (22).

Axt Manal font was unreadable in 2, 3 and 4 pt. sizes, and in reversed typeface with 5 pt. size, and numbers and glyphs were hardly readable in reversed 6 pt. size, figure (23).

Axt Manal Black font was unreadable in 2 and 3 pt. sizes and was hardly readable in both positive and reversed 4 pt. size, figure (24).
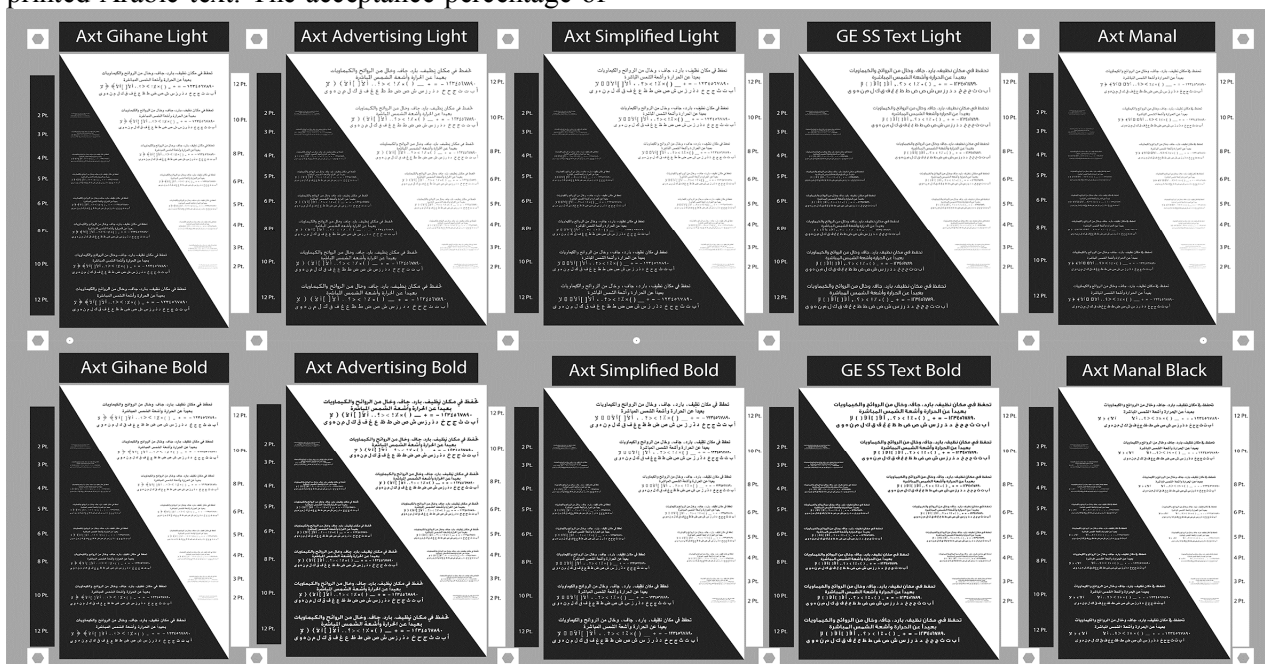

Figure (14): Test form

Table (1) Readability and legibility results

Fonts	2 pt. Pos.	2 pt. Rev.	3 pt. Pos.	3 pt. Rev.	4 pt. Pos.	4 pt. Rev.	5 pt. Pos.	5 pt. Rev.	6 pt. Pos.	6 pt. Rev.	8 pt. Pos.	8 pt. Rev.	10 pt. Pos.	10 pt. Rev.	12 pt. Pos.	12 pt. Rev.
Axt Gihan Light	×	×	×	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Acceptance percentage	0%	0%	0%	0%	85%	75%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Axt Gihan Bold	×	×	×	×	✓	✓ n(×)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Acceptance percentage	0%	0%	15%	10%	95%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
AXT Advertising Light	×	×	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Acceptance percentage	0%	0%	80%	10%	95%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
AXT Advertising Bold	×	×	✓	✓ n(×)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Acceptance percentage	0%	0%	85%	80%	95%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
AXT Simplified Light	×	×	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Acceptance percentage	0%	0%	85%	0%	85%	65%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
AXT Simplified Bold	×	×	✓ n(×)	✓ n(×)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Acceptance percentage	0%	0%	80%	80%	95%	80%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
GE SS Text Light	×	×	×	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Acceptance percentage	0%	0%	30%	15%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
GE SS Text Bold	×	×	hr n(×)	hr n(×)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Acceptance percentage	0%	0%	70%	65%	100%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Axt Manal	×	×	×	×	×	×	✓	×	✓	✓ n(hr)	✓	✓	✓	✓	✓	✓
Acceptance percentage	0%	0%	0%	0%	0%	0%	65%	35%	90%	80%						
Axt Manal Black	×	×	×	×	hr	hr	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Acceptance percentage	0%	0%	0%	0%	55%	55%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Pos. = positive, Rev. = reversed, × = unreadable, ✓ = readable, hr = hardly readable, n (×) = numbers and glyphs are not readable, and n(hr) = numbers are hardly readable.

The acceptance (%) of the readability and legibility of the Arabic fonts is represented in chart (1), chart (2), chart (3), and chart (4).
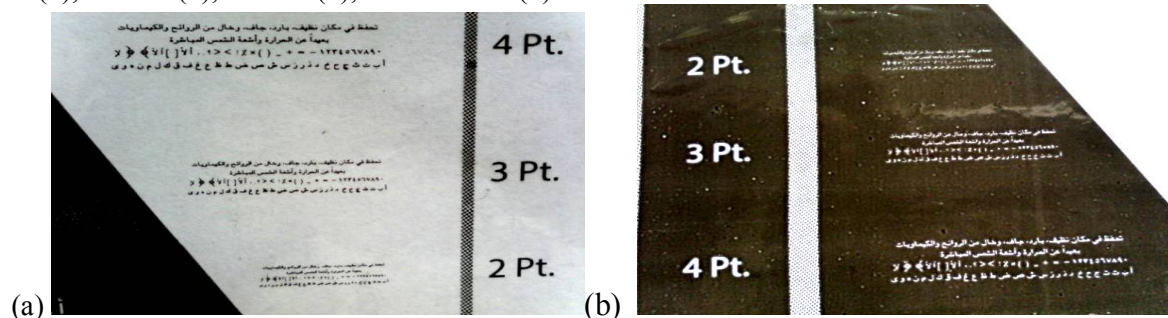

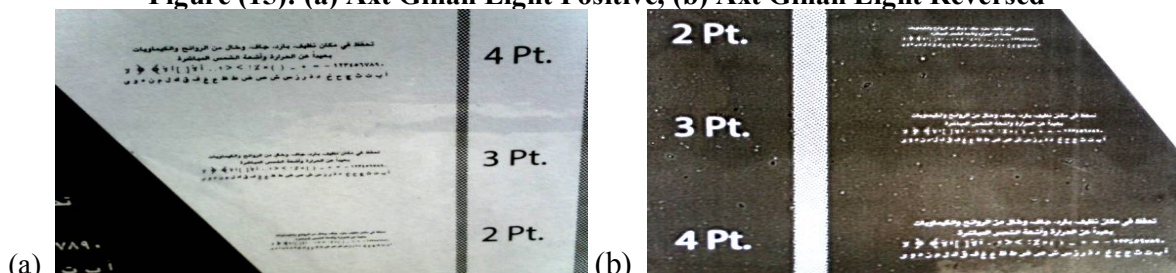**Figure (15): (a) Axt Gihan Light Positive, (b) Axt Gihan Light Reversed**

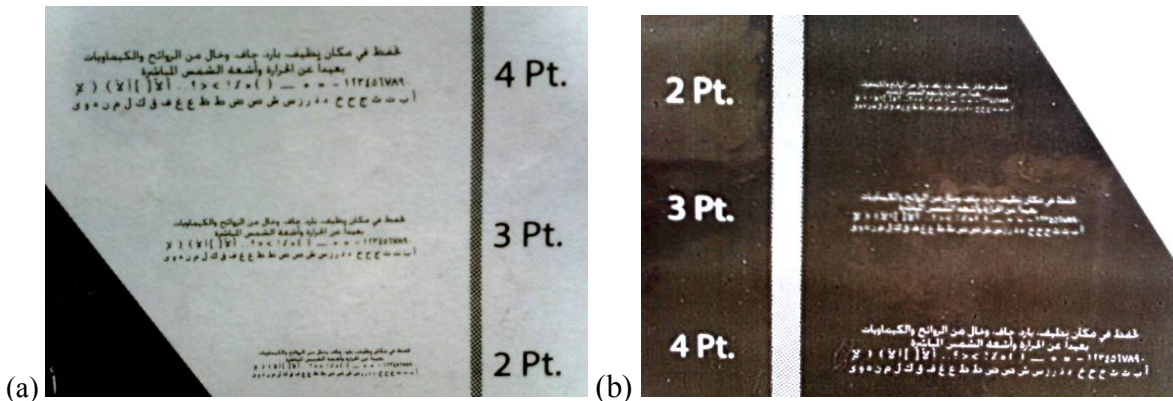**Figure (16): (a) Axt Gihan Bold Positive, (b) Axt Gihan Bold Reversed**

(a)   (b)

Figure (17): (a) Axt Advertising Light Positive, (b) Axt Advertising Light Reversed
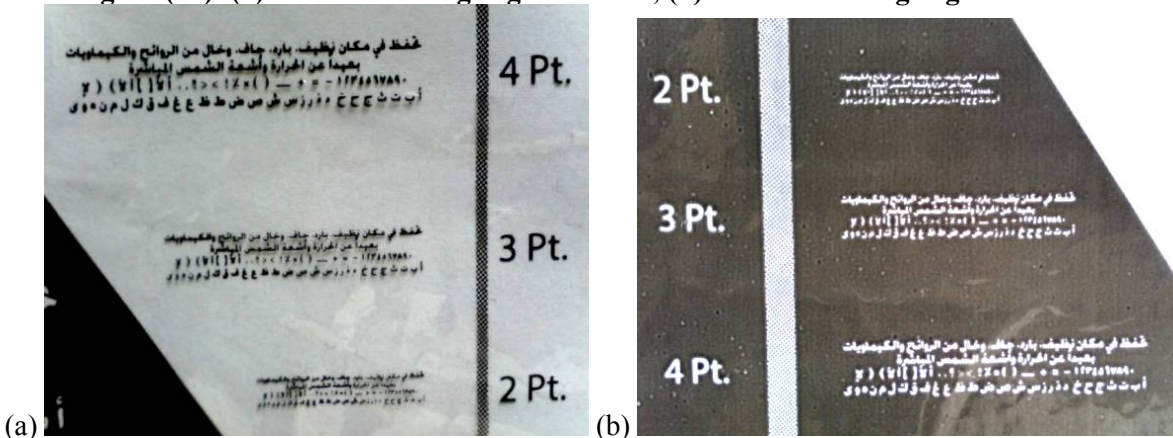
(a)   (b)

Figure (18): (a) Axt Advertising Bold Positive, (b) Axt Advertising Bold Reversed
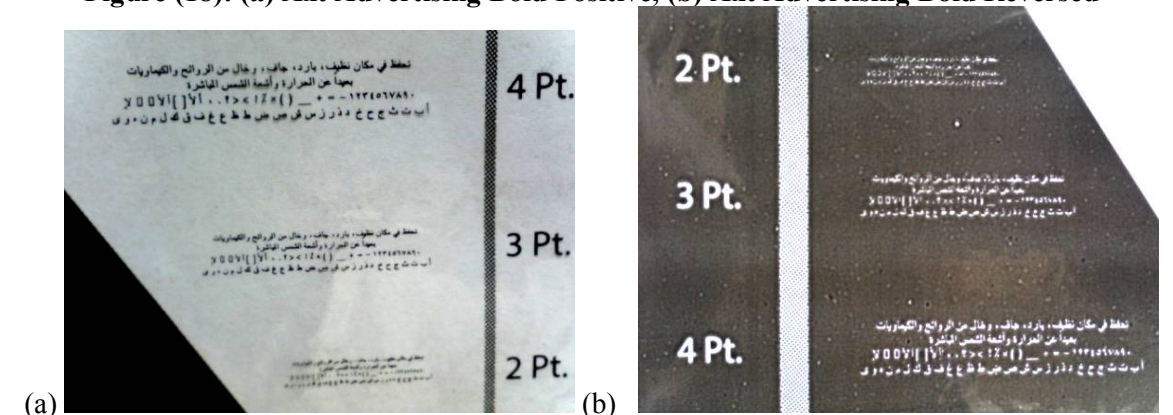
(a)   (b)

Figure (19): (a) Axt Simplified Light Positive, (b) Axt Simplified Light Reversed
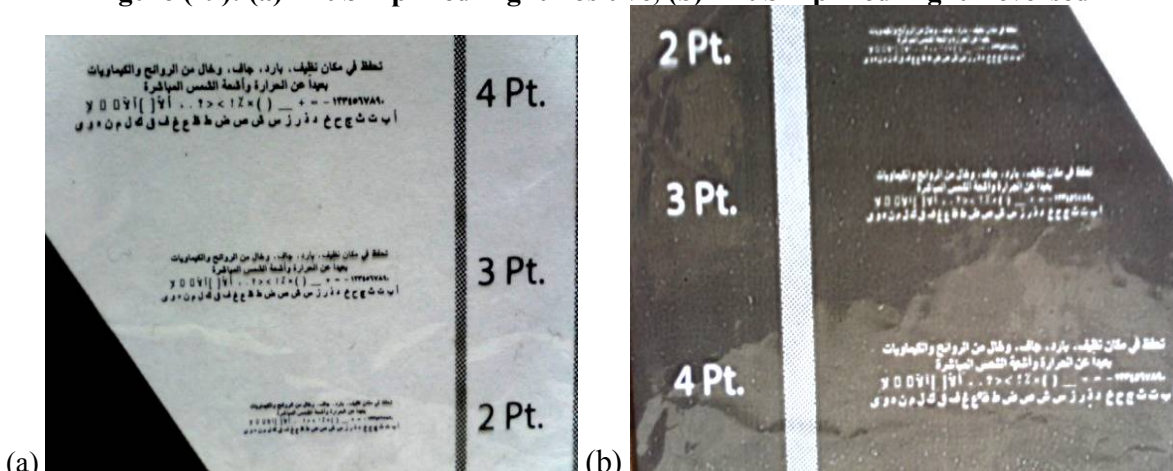
(a)   (b)

Figure (20): (a) Axt Simplified Bold Positive, (b) Axt Simplified Bold Reversed
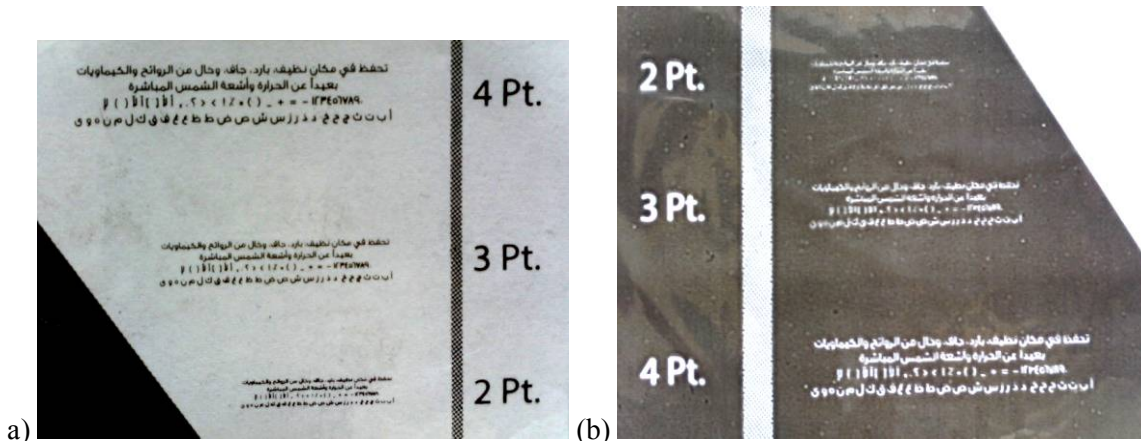
Figure (21): (a) GE SS Text Light Positive, (b) GE SS Text Light Reversed
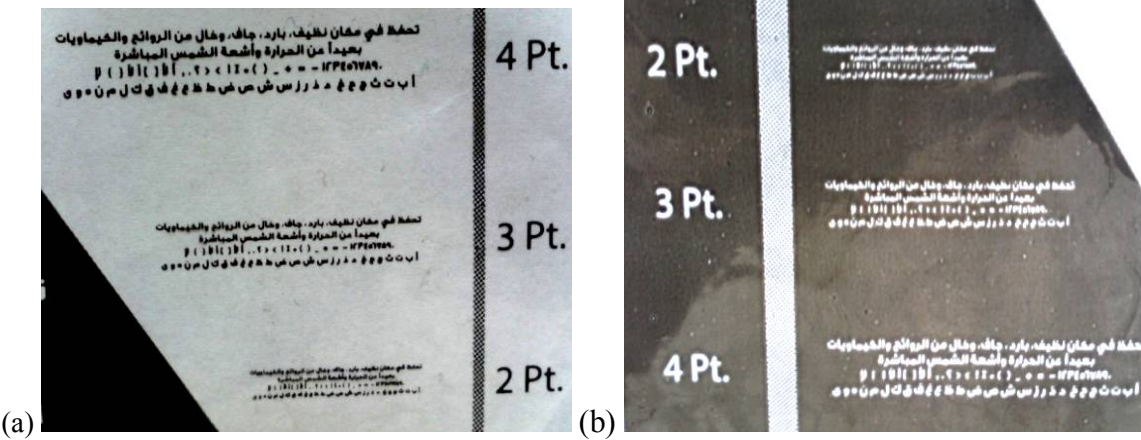
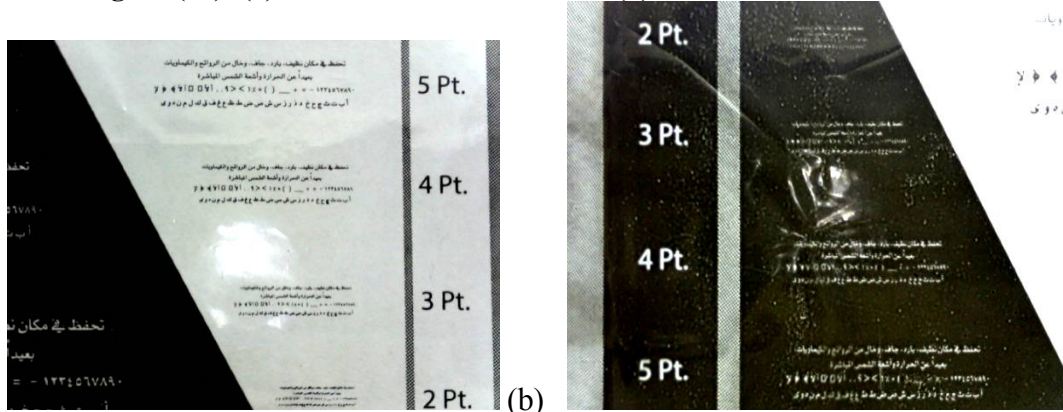**Figure (22): (a) GE SS Text Bold Positive, (b) GE SS Text Bold Reversed**

Figure (23): (a) Axt Manal Positive, (b) Axt Manal Reversed

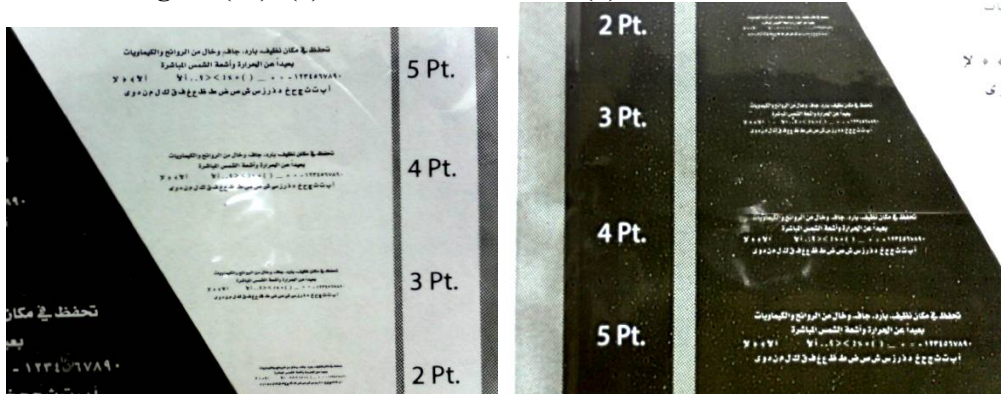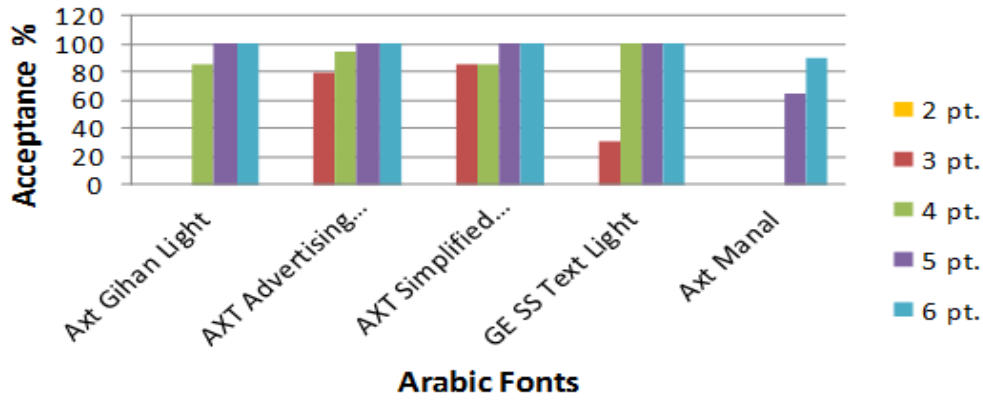**Figure (24): (a) Axt Manal Black Positive, (b) Axt Manal Black Reversed**

Chart (1): readability and legibility for light positive Arabic fonts

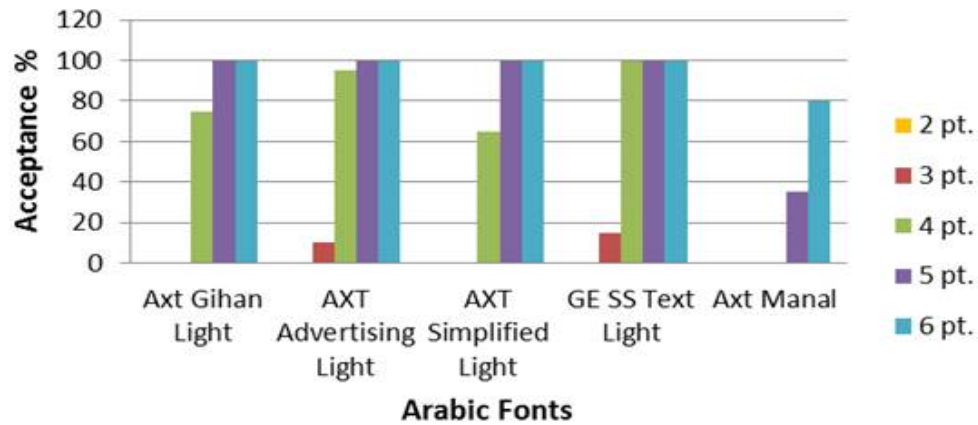
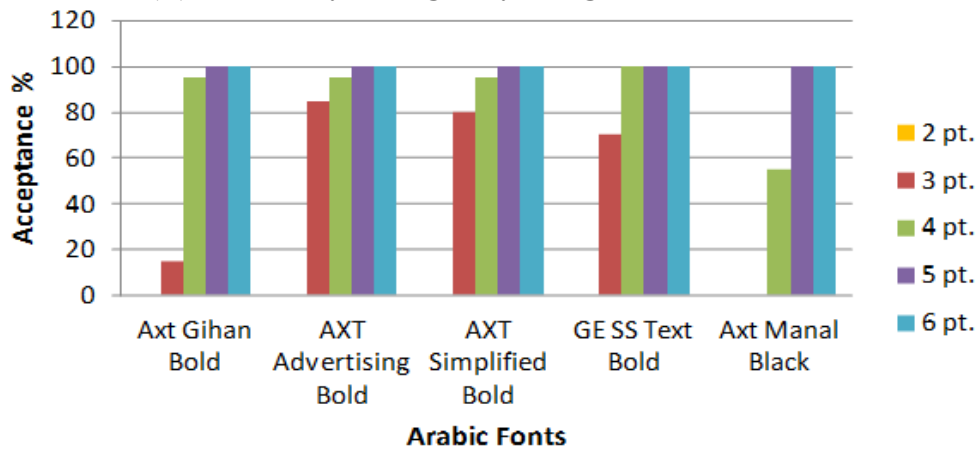**Chart (2): readability and legibility for light reversed Arabic fonts**

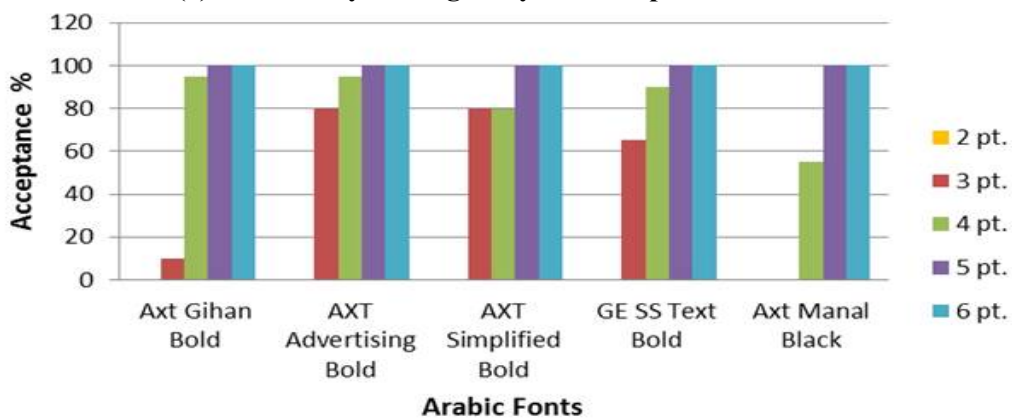**Chart (3): readability and legibility for bold positive Arabic fonts**

Chart (4): readability and legibility for bold reversed Arabic fonts

5. Conclusion

The font must be compatible with the nature the flexographic printing process and its variables then at the end the readability and legibility are gained.

As a result of the experimental and investigation, the following conclusions have been drawn:

All Arabic typefaces were unreadable in 2 pt. size in both positive and reversed styles. The best positive Arabic typefaces in 3 pt. size were AXT Advertising Light, AXT Advertising Bold, and AXT Simplified Light. Most Arabic fonts were readable in 4 pt. size except Axt Manal and Axt Manal Black in both positive and reversed styles. Starting from 5 pt. font size is considered ideal in readability and legibility in both positive and reversed styles except with reversed Axt Manal font.

6. Recommendations

- Generally a bigger font size should be used for numbers than text size.
- Arabic typefaces that have good readability and legibility should be used foremost regardless of the aesthetic aspect of the font.
- It is recommended to use high screen rulings of anilox rolls for small sizes of fonts.
- A reference guide of the suitable Arabic fonts for flexographic printing must subject to a fingerprinting test according to the printing machine and to the substrates used.

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