**Chapter 2**

**REVIEW OF RELATED LITERATURE AND STUDIES**

One of the significance step is research project is conducting a literature review. Through this chapter, the readers can familiarize to the study of researcher. The related and previous studies presented in this chapter will give the readers and future researcher, an idea of the proposed system of the proponent. The proponent selected and reviewed these studies and previous works to provide information to the readers.

This chapter presents literatures and studies done by experts that have significant bearing to this project.

**Foreign Literature**

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The researcher gathered information related to their study to prove the effectiveness of the proposed system. This information was based on the knowledge of which served as guide to the researcher to pursue the study. Barcode technology works of off a principle called symbology. According to Spielberg (1995) “Symbology at its basic form is what defines the barcode; it determines the mapping and interpretation of the encoded information or data.” This encoding allows the scanning device to know when a digit or character starts and when it stops, similar to a binary representation. We recognize barcodes as an array of parallel lines alternating between white and black lines. Barcode technology provides a simple and inexpensive method of recording data or information in a number of applications.

The symbologies of the barcode technology can be arranged or mapped in a variety of ways (Simon, 1998). A continuous symbology is marked by the characters beginning with a black line and ending with a white line or space, while discreet symbologies have characters encoded as a black line a space and then another black line. This takes care of the characters and how each individual number or letter is read. The lines of a barcode also have variances in encoding the widths of the lines. Some barcode technology systems use two separate widths to determine the character while others use multiple width lines. The use of any of these encoding styles depends, of course, on the application for which the barcode technology is being used.

Silversterstone (1988) posited that the line or linear barcode technology is sometimes referred to as 1D encoding. While we are most familiar with these barcodes, there are more complex codes that employ the use of dot matrixes to achieve a more complex encoding process that can store and identify far more information. These are referred to as 2D or, in some cases data glyphs. They are comprised of miniature dots, like the old dot matrix printers, which create patterns that are read in the scanning process. They are not limited to this format and can be comprised of circular patterns or a collection of shapes and modules inserted into a specified image for a user.

In order to read the data of barcode technology it needs to be scanned by a laser and then interpreted. The scanners, or lasers, used to read the barcodes measures the light reflected form the linear barcode technology and can distinguish between the white and black lines. Calibration of the laser and system needs to be done to ensure the proper interpretation of the code itself as has been shown (Leither & Monarch, 1999). This has to do with whether it is a continuous or discreet symbology, 1D or 2D images, and whether it uses two width or multiple width lines. The most common lasers used are helium neon lasers due to their low energy consumption and efficiency.

The complex or 2D barcodes cannot be read by a simple laser as the linear barcode technology can as Keith and Saint (2002) demonstrated. The barcode needs an all encompassing reader as the full image needs to be read. Linear barcode technology only needs to be swept across to read it as the lines are the same regardless of the position of the laser. 2D codes must be read or scanned by an image based scanner, similar to the scanners used at home or in offices to scan documents and images. Kudmann, Katherman, and Silken (2005) found that more costly but supply more information and data. These are used in encoding URLs for cellular phone use and higher end applications.

**Local Literature**

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Barcode Technology

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Salvador et al. (2005) found that barcode technology works of off a principle called symbology. Symbology at its basic form is what defines the barcode; it determines the mapping and interpretation of the encoded information or data. This encoding allows the scanning device to know when a digit or character starts and when it stops, similar to a binary representation (Salvador & Santos, 2014). We recognize barcodes as an array of parallel lines alternating between white and black lines. Barcode technology provides a simple and inexpensive method of recording data or information in a number of applications.

Cruz, De Guzman, and Ambrocio (1789) found that the symbologies of the barcode technology can be arranged or mapped in a variety of ways. A continuous symbology is marked by the characters beginning with a black line and ending with a white line or space, while discreet symbologies have characters encoded as a black line a space and then another black line. This takes care of the characters and how each individual number or letter is read. The lines of a barcode also have variances in encoding the widths of the lines. Some barcode technology systems use two separate widths to determine the character while others use multiple width lines. The use of any of these encoding styles depends, of course, on the application for which the barcode technology is being used.

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Hernandez et al. (1986) marked that the complex or 2D barcodes cannot be read by a simple laser as the linear barcode technology can. The barcode needs an all-encompassing reader as the full image needs to be read. Linear barcode technology only needs to be swept across to read it as the lines are the same regardless of the position of the laser. 2D codes must be read or scanned by an image based scanner, similar to the scanners used at home or in offices to scan documents and images. They are more costly but supply more information and data. These are used in encoding URLs for cellular phone use and higher end applications.

**Foreign Studies**

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Several studies (Wenbergg & Johnson, 1990; West & Kent, 2002; Peter & Einsten, 2001) indicate that the symbologies of the barcode technology can be arranged or mapped in a variety of ways. A continuous symbology is marked by the characters beginning with a black line and ending with a white line or space, while discreet symbologies have characters encoded as a black line a space and then another black line. This takes care of the characters and how each individual number or letter is read. The lines of a barcode also have variances in encoding the widths of the lines. Some barcode technology systems use two separate widths to determine the character while others use multiple width lines. The use of any of these encoding styles depends, of course, on the application for which the barcode technology is being used.

Lewis, Cornelli, and Fox (2007) concluded that the line or linear barcode technology is sometimes referred to as 1D encoding. While we are most familiar with these barcodes, there are more complex codes that employ the use of dot matrixes to achieve a more complex encoding process that can store and identify far more information. These are referred to as 2D or, in some cases data glyphs. They are comprised of miniature dots, like the old dot matrix printers, which create patterns that are read in the scanning process. They are not limited to this format and can be comprised of circular patterns or a collection of shapes and modules inserted into a specified image for a user.

In order to read the data of barcode technology it needs to be scanned by a laser and then interpreted. The scanners, or lasers, used to read the barcodes measures the light reflected form the linear barcode technology and can distinguish between the white and black lines. Smith and Spencer (1980) believed that calibration of the laser and system needs to be done to ensure the proper interpretation of the code itself. This has to do with whether it is a continuous or discreet symbology, 1D or 2D images, and whether it uses two width or multiple width lines. The most common lasers used are helium neon lasers due to their low energy consumption and efficiency.

Gray and Black (1990, 2003) stated that the complex or 2D barcodes cannot be read by a simple laser as the linear barcode technology can. The barcode needs an all encompassing reader as the full image needs to be read. Linear barcode technology only needs to be swept across to read it as the lines are the same regardless of the position of the laser. 2D codes must be read or scanned by an image based scanner, similar to the scanners used at home or in offices to scan documents and images. They are more costly but supply more information and data. These are used in encoding URLs for cellular phone use and higher end applications.

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Mariano (1992) found that symbologies of the barcode technology can be arranged or mapped in a variety of ways. A continuous symbology is marked by the characters beginning with a black line and ending with a white line or space, while discreet symbologies have characters encoded as a black line a space and then another black line. This takes care of the characters and how each individual number or letter is read. The lines of a barcode also have variances in encoding the widths of the lines. Some barcode technology systems use two separate widths to determine the character while others use multiple width lines. The use of any of these encoding styles depends, of course, on the application for which the barcode technology is being used.

Cabuhat et al. (1992) observed that the line or linear barcode technology is sometimes referred to as 1D encoding. While we are most familiar with these barcodes, there are more complex codes that employ the use of dot matrixes to achieve a more complex encoding process that can store and identify far more information. These are referred to as 2D or, in some cases data glyphs. They are comprised of miniature dots, like the old dot matrix printers, which create patterns that are read in the scanning process. They are not limited to this format and can be comprised of circular patterns or a collection of shapes and modules inserted into a specified image for a user.

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Manuel and Galang (2015) concluded that the complex or 2D barcodes cannot be read by a simple laser as the linear barcode technology can. The barcode needs an all encompassing reader as the full image needs to be read. Linear barcode technology only needs to be swept across to read it as the lines are the same regardless of the position of the laser. 2D codes must be read or scanned by an image based scanner, similar to the scanners used at home or in offices to scan documents and images. They are more costly but supply more information and data. These are used in encoding URLs for cellular phone use and higher end applications (Reyes, 2000).