Writing the alphabet using dots, pixillated alphanumerics, and cross-stitch

When computers started having screens (or monitors), as well as printers, a new alphanumeric display was created using dots. A crucial variable in designing alphabet letters and digits, using dots, is the height of the display, measured in dots. A height of three dots is too small to represent many of the letters, as is a width of three dots. A square grid that is five dots high and five dots wide is also inadequate. More height is needed to allow the ascenders and descenders of lower-case letters, and to include the “holes” and other features of B, P, and R, for example. Six dots high and five dots wide is the smallest grid size that allows distinctly readable letters. Consider these examples:

![Image of alphabet letters created using dots]

Figure 1. A–F. The rest of the alphabet may be left as homework.

As soon as we start trying to create a display of alphanumeric characters using a grid of dots we encounter design issues. Where, for example, or at what “height” should the horizontal “bars” occur in A, B, E, F, and H? How wide should each letter be? How can we best represent the circles and part-circles that appear in b, c, d, g, p, q, and in e, and r? Consider these different designs for W, Y and X:

![Image of different designs for W, Y and X]

Figure 2. Different designs for W, Y and X.

Which is easier to read, as the specific letter? Which is visually more acceptable? Which fits an overall scheme that ensures that as many letters as possible share the same features? We could, for example, aim to have as many letters as possible using the all-horizontal all-vertical design feature of the first W and the third Y.

These are the same design questions tackled by designers of typefaces or fonts.
Would it help if we used a grid height of seven-dots or even nine-dots, with a seven-dot width? Here is part of a 5W × 7H solution:

![Image of a grid with letters and numbers]

and

![Image of another grid with letters and numbers]

Figure 3. Part of a 5W × 7H solution.

Finally, without going into enormous detail, consider two further things. First, all letters that appear on a computer screen are created using this grid pattern of dots, each dot being a pixel, the smallest visible point on a computer screen. (The word ‘pixel’ is made from the two words “picture element”.) Here are some alphanumerics from a computer-screen, magnified to show the pixels. The font is Times New Roman, text-size 24. Typed, it looks like this:

**MPQxyz**

But, magnified, you can see the pixels as small squares:

![Image of magnified letters]

Figure 4. Letters magnified to show pixels.

Also, in the pre-computer world of handicrafts, letters created in cross-stitch, or needlepoint, or tapestry, are also made of an arrangement of dots, specifically a stitched “cross”, or similar piece of stitching. Figure 5 shows a cross-stitch example. Each dot in the grid-pattern represents a stitched X.
There are, it must be strongly emphasised, many hundreds of different ways of creating an artistically matching set of letters and numbers using cross-stitch 'dots' (actually two oppositely slanted diagonal lines that cross at a point). (But perhaps that is another story…)

A pixel or 'dot' is like a one-stud Lego brick. There are at least two main ways to make alphanumerics using Lego bricks. They may be pieced together, flat, on an underlying Lego base-plate, so that the characters are "read" in bird's-eye view. Alternatively they may be built upwards, so the letter-structure stands vertically and the characters are read in horizontal or oblique view. Here are examples to illustrate both methods.

Lego also has special bricks that have printed letters and numerals so that shop-signs and other labels can be easily built into Lego constructions.