

## Week 5: Design Matrix & AHP Methodologies

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### Decision Matrix

Selecting an LCD Screen for our 3-in-1 stopwatch.

Identifying alternatives:

1. SunFounder IIC I2C 20x4 LCD Screen ([Amazon.com: SunFounder LCD2004 Module with 3.3V Backlight Compatible with Arduino R3 Mega2560 Raspberry Pi Display of 20x4 White Characters on Blue Background. : Electronics](#))
2. SING F LTD 20x4 LCD ([Amazon.com: SING F LTD Serial 2004 20x4 LCD Module Shield 5V Character LCD Module Display : Electronics](#))
3. Nextion Basic Display ([Amazon.com: Nextion Basic Display 2.8" NX3224T028 2.8inch TFT Resistive Touch Screen Panel 320X240 UART HMI Intelligent LCD Display Module for Arduino Raspberry Pi ESP8266 : Electronics](#))

Criteria	Weight scale $w_m$ (1-5)	SunFounder Display	SING F LTD Display	Nextion Display
Cost	4	4	5	2
Compatibility	5	5	4	5
Screen size	5	5	4	3
Power Consumption	2	1	1	1
Weight	3	5	3	4
Total Score		83	71	62

Table 1.1. Decision Matrix table for an LCD Screen.

We can see from our decision matrix that the SunFounder display scored the highest at 83. In second place was the SING F LTD display with a score of 71. Finally, the Nextion display has a score of 62. From this, we can conclude that the SunFounder display is the winner and should be selected based on the criteria of our decision matrix. Of course, there are other factors that can be considered but these were the most important factors in selecting our display.

## Analytical Hierarchy Process (AHP)

Selecting an LCD Screen for our 3-in-1 stopwatch.

<b>1</b>	Equal
<b>3</b>	“Moderately” more important
<b>5</b>	“Strongly” more important
<b>7</b>	“Very strongly” more important
<b>9</b>	“Extremely” more important

*Table 2.1. Pair-wise comparison of each criterion for relative importance.*

	<b>Cost</b>	<b>Compatibility</b>	<b>Screen Size</b>	<b>Power Consumption</b>	<b>Screen Weight</b>	<b>Mean</b>	<b>Weight</b>
<b>Cost</b>	1	1/3	3	5	7	2	0.28
<b>Compatibility</b>	3	1	5	3	9	3.3	0.46
<b>Screen Size</b>	1/3	1/5	1	3	3	0.9	0.14
<b>Power Consumption</b>	1/5	1/3	1/3	1	5	0.6	0.08
<b>Screen Weight</b>	1/7	1/9	1/3	1/5	1	0.3	0.04

*Table 2.2. Determining criteria weightings and calculations.*

	<b>Cost</b>	<b><math>\alpha</math></b>	<b>Cost Rating</b>
<b>SunFounder</b>	\$10.99	0.67	0.35
<b>SING F LTD</b>	\$7.39	1.0	0.53
<b>Nextion</b>	\$32.99	0.22	0.12

Table 2.3. Cost rating between brands.

	<b>Star Rating</b>	<b><math>\alpha</math></b>	<b>Compatibility Rating</b>
<b>SunFounder</b>	5	1	0.48
<b>SING F LTD</b>	3.5	0.7	0.33
<b>Nextion</b>	2	0.4	0.19

Table 2.4. Compatibility rating between brands.

	<b>SunFounder</b>	<b>SING F LTD</b>	<b>Nextion</b>	<b>Screen Size Rating</b>
<b>SunFounder</b>	1	1/3	5	0.39
<b>SING F LTD</b>	3	1	1/4	0.30
<b>Nextion</b>	1/5	4	1	0.31

Table 2.5. Screen size rating between brands.

	<b>SunFounder</b>	<b>SING F LTD</b>	<b>Nextion</b>	<b>Power Consumption Rating</b>
<b>SunFounder</b>	1	1	1	0.33
<b>SING F LTD</b>	1	1	1	0.33
<b>Nextion</b>	1	1	1	0.33

Table 2.6. Power consumption rating between brands. The working voltage for all three brands are identical (working voltage = 5V).

	SunFounder	SING F LTD	Nextion	mean	Screen Weight Rating
<b>SunFounder</b>	1	3	5	2.5	0.64
<b>SING F LTD</b>	1/3	1	3	1	0.26
<b>Nextion</b>	1/5	1/3	1	0.4	0.1

*Table 2.7 Screen weight rating between brands*

		SunFounder	SING F LTD	Nextion
<b>Cost</b>	0.28	0.35	0.53	0.12
<b>Compatibility</b>	0.46	0.48	0.33	0.19
<b>Screen Size</b>	0.14	0.39	0.30	0.31
<b>Power Consumption</b>	0.08	0.33	0.33	0.33
<b>Screen Weight</b>	0.04	0.64	0.26	0.10
<b>Score</b>		<b>0.44</b>	<b>0.30</b>	<b>0.21</b>

*Table 2.8. Final AHP table.*

We can see from our Analytical Hierarchy Process (AHP) that the SunFounder scored the highest. The SING F LTF display placed second, and the Nextion display placed third. This matches our final result from our Decision Matrix. Before we began our AHP analysis, we had assumed our final result would match our Decision Matrix done before. This process helped us make a decision on which display to use for our project.