Decision Matrix

criteria	weight	alternative 1	alternative 2	alternative 3
		Design a cape that mates with microcontroller dev board and screen	Design board with µC BMS with DAC and Screen daughterboards connected	Design a board that integrates everything onto a single board
Price	2	3	2	1
Design Time	3	3	2	1
Debug Complexity	4	3	2	1
Meets Project Requirements	5	4	5	3
STYLE BABY!!!!!	3	3	4	5
Confidence	5	4	3	2
Score		76	70	49

The cape design wins! Ultimately we value not having to purchase and design an STM chip and boot loader to place on our PCB's. Because we already have development boards for the STM32 chip, using the boards as they are will be easiest for all of our design and assembly requirements.

Attribute Hierarchy Process (AHP)

Column 1	Column 2	Design a cape that mates with μC dev board and screen	Design board with μC BMS with DAC and Screen daughterboards connected	Design a board that integrates everything onto a single board
Price	0.04	0.66	0.26	0.08
Design Time	0.12	0.65	0.23	0.12
Debug Complexity	0.23	0.70	0.21	0.08
Meets Project Requirements	0.43	0.09	0.32	0.59
STYLE BABY!!!!!	0.03	0.10	0.33	0.57
Confidence	0.13	0.66	0.26	0.08
Score		0.41	0.27	0.32
total	1.00			

The same final answer was chosen, designing a cape or shield, but the margin is greater compared to the regular design matrix, and designing a board with some components integrated lost by a larger margin.

Price					
	Shield	Partial	Full	Prece Rating	Price Mean
Shield	1.00	3.00	7.00	2.76	0.66
Partial	0.33	1.00	4.00	1.10	0.26
Full	0.14	0.25	1.00	0.33	0.08
				4.19	1.00

The price of a shield is less than a partial PCB since it needs less parts piecemeal, and even less so than the full board. The partial board will be marginally less expensive than the full board due to integrating more parts onto the full one.

Design Time					
	Shield	Partial	Full	Design Rating	Price Mean
Shield	1.00	3.00	5.00	2.47	0.65
Partial	0.33	1.00	2.00	0.87	0.23
Full	0.20	0.50	1.00	0.46	0.12
				3.80	1.00

The shield design will be very simple to design because it will not require us to place and route a microcontroller on our PCB. The partial board is more complicated because of the microcontroller's presence, but with fewer components than the full design it is simpler than the full design.

Debug Complexity					
	Shield	Partial	Full	Debug Rating	Price Mean
Shield	1.00	4.00	7.00	3.04	0.70
Partial	0.25	1.00	3.00	0.91	0.21
Full	0.14	0.33	1.00	0.36	0.08
				4.31	1.00

The shield will be the easiest to debug, and the full board will take the longest because it will have the most components on the board. The Partial board's microcontroller will make it more complex to debug than the Shield.

STYLE BABY!!!!!					
	Shield	Partial	Full	STYLE Rating	Price Mean
Shield	1.00	0.25	0.20	0.37	0.10
Partial	4.00	1.00	0.50	1.26	0.33
Full	5.00	2.00	1.00	2.15	0.57
				3.78	1.00

The shield is a safe, not all that innovative decision. The partial board is more complex, and placing a microcontroller would be cool. Putting everything onto a single PCB would be RAD.

Confidence					
	Shield	Partial	Full	Confidence Rating	Price Mean
Shield	1.00	3.00	7.00	2.76	0.66
Partial	0.33	1.00	4.00	1.10	0.26
Full	0.14	0.25	1.00	0.33	0.08
				4.19	1.00

We are most confident in our ability to make and design a shield in the time we have. The more complex boards we are less confident with.

Meets Project Requirements					
	Shield	Partial	Full	Requirement Rating	Price Mean
Shield	1.00	0.25	0.17	0.35	0.09
Partial	4.00	1.00	0.50	1.26	0.32
Full	6.00	2.00	1.00	2.29	0.59
				3.90	1.00

The full board satisfies the "should" of everything being surface mounted to our PCB, whereas the shield will have more through hole components, meeting less of that requirement.