MHS

MOBILE HARDWARE SAMPLER

AP number	Work package	Project part	Duration (days)	Predecessor
1	audio playback and storage	Audio	10	0
2	sample selection with rotary encoder	Display	10	3
3	displaying selected sample names	Display	10	0
4	menu design (structure and visuals)	Display	5	3
5	line out playback	Audio/Midi	5	1
6	recording with line in and mic	Audio/Midi	10	1
7	master volume control	Audio/Midi	5	5
8	Midi connection over DIN 5 connecto	Midi	10	0
9	digital effects and filters (at least 2)	Audio	15	1, 5, 7
10	menu extension: controlling effects	Display	10	2, 3, 4, 9
11	Adding 4 velocity sensitive pads	Audio/Midi	10	1, (12)
12	recording midi	Audio/Midi	10	8
13	2-8 voice polyphony	Audio	5	1, (9)
14	case design and crafting	Display	10	2, 5, 6, 8
15	pcb assembly	Audio/Midi	10	2, 5, 6, 8
16	device assembly (case + pcb)	All	10	15, 14
17	testing performance stability	All	10	1 – 13
18	testing mobility	All	5	16, (17)
19	testing usability	All	5	2, 3, 4, 10 – 13, (18)

STAGE 1

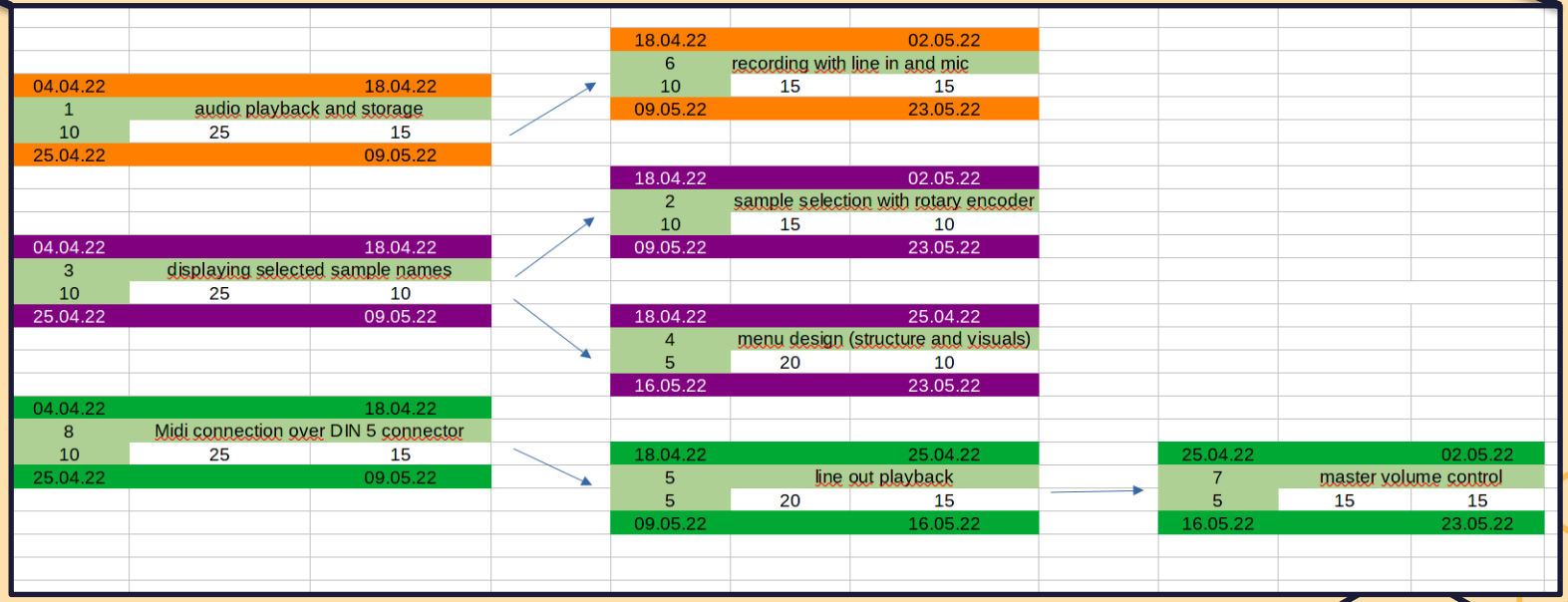
Stage 2

Stage 3

Testing and troubleshooting

Nr.	Work package	Duration	CW 14 (04.04.)					CW 15 (11.04)					CW 16 (18.04.)					CW 17 (25.04.)					CW 18 (02.05.)					CW 19 (09.05.)					CW 20 (16.05.)				
			M	D	M	D	F	M	D	M	D	F	M	D	M	D	F	M	D	M	D	F	M	D	M	D	F	M	D	M	D	F	M	D	M	D	F
1	**Stage 1**	**7 weeks**																																			
2	audio playback and storage	10 days																																			
3	sample selection with rotary encoder	10 days																																			
4	displaying selected sample names	10 days																																			
5	menu design (structure and visuals)	5 days																																			
6	line out playback	5 days																																			
7	recording with line in and mic	10 days																																			
8	master volume control	5 days																																			
9	Midi connection over DIN 5 connector	10 days																																			

buffer



Nr.	Work package	Duration	CW 21 (23.05.)					CW 22 (30.05.)					CW 23 (06.06.)					CW 24 (13.06.)					CW 25 (20.06.)					CW 26 (27.06.)					CW 27 (04.07.)					CW 28 (11.07.)				
			M	D	M	D	F	M	D	M	D	F	M	D	M	D	F	M	D	M	D	F	M	D	M	D	F	M	D	M	D	F	M	D	M	D	F	M	D	M	D	F
10	**Stage 2**	**8 weeks**																																								
11	digital effects and filters (at least 2)	15 days																																								
12	menu extension: controlling effects	10 days																																								
13	Adding 4 velocity sensitive pads	10 days																																								
14	recording midi	10 days																																								
15	2-8 voice polyphony	5 days																																								

buffer

23.05.22		13.06.22		13.06.22	20.06.22
9	digital effects and filters (at least 2)			13	2-8 voice polyphony
15	25	20		5	20 20
20.06.22		11.07.22		11.07.22	18.07.22
23.05.22		06.06.22			
10	menu extension: controlling effects				
10	30	30			
04.07.22		18.07.22			
23.05.22		06.06.22		06.06.22	20.06.22
11	Adding 4 velocity sensitive pads			12	recording midi
10	30	20		10	20 20
20.06.22		04.07.22		04.07.22	18.07.22

Nr.	Work package	Duration	CW 21 (23.05.)	CW 22 (30.05.)	CW 23 (06.06.)	CW 24 (13.06.)	CW 25 (20.06.)	CW 26 (27.06.)	CW 27 (04.07.)	CW 28 (11.07.)
			M D M D F	M D M D F	M D M D F	M D M D F	M D M D F	M D M D F	M D M D F	M D M D F
16	**Stage 3**	**4 weeks**								
17	case design and crafting	10 days								
18	pcb assembly	5 days								
19	device assembly (case + pcb)	5 days								

23.05.22		13.06.22		13.06.22	20.06.22
9	digital effects and filters (at least 2)			13	2-8 voice polyphony
15	25	20	→	5	20	20
20.06.22		11.07.22		11.07.22	18.07.22
23.05.22		06.06.22			
10	menu extension: controlling effects				
10	30	30			
04.07.22		18.07.22			
23.05.22		06.06.22		06.06.22	20.06.22
11	Adding 4 velocity sensitive pads			12	recording midi
10	30	20	→	10	20	20
20.06.22		04.07.22		04.07.22	18.07.22

Quality Control

1. Real Time DSP
2. Clear User Control
3. Sample Polyphony
4. Modern looking
5. Connectivity

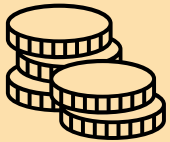
Quality Control

1
2
3
4
5

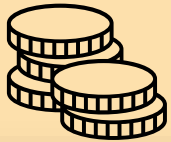
Quality Goals	Quality Criteria	Achieve Quality Goals	Quality Control
Real Time DSP	20ms Latency	Separated Audio and Display/Input Threads.	Often called Functions in the “hot” part as efficient as possible.
Clear User Control	Intuitive usability of the product	Always show the current state of the Device! Naming the Controls on the Device.	Tests with unfamiliar Persons to use the Device
Sample Polyphony	2 - 8 Samples Concurrent	Good Structure of the 128M-Bit Ram. Fast Communication with the Teensy 4.0	Include a Playback Test with the specified Polyphony
Modern looking	Smooth Feeling and modern Design	Inform about how to achieve good quality with 3D-Printers.	Tests with unfamiliar Persons
Connectivity	Easy connection between other musical Devices	Using Midi In - Out and Midi Host as well the Line In and Out Jack	Connect different Midi Devices and use various Software to check the Host Functionality. Good sound Quality with Line In & Out

Hardware Cost

Partname	Function	Quantity	Price/Pc
Teensy 4.0 Development Board	Microcontroller	1	18.64
Audio Adaptor Board Rev. D	Audio Shield	1	13.23
14-Pin Header Double Insulator		2	0.084
	Exp-Tech		**32.038**
EA OLEDM204	Display	1	24.22
6N138	Optocoupler 100kBaud	1	0.56
	Reichelt		**24.22**
AOM-6738P-R	Electret Condenser Mic	1	1.07
W25Q128JVSIM	128M-Bit Flash Memory	1	1.71
	Midi		
Adafruit 1134	Midi In/Out	2	1.59
Resistors	1x220, 1x470, 2x47	1	0.56
	Extra Parts		
NMJ4HCD2	TS 1/4" Jack	4	1.5
P160KN-0FD18C10K	10k Poti linear	4	0.81
PEC11H-4220F-S0024	Rotary Encoder, 24 ppr, Button	1	2.33
74HC4051	8:1 Analog Multiplexer	1	0.63
	Mouser:		**18.72**
	Essentials:		**74.978**



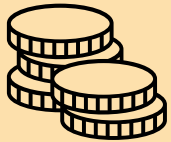
Time Expense



Phase	Time	Buffer
Preparation and Information	85h	± 5h
Hardware	100h	± 5h
Team Meetings	115h	± 7h
Software Development	450h	± 30h
Testing	100h	± 5h
Documentation	50h	± 3h
SUM	900h	± 55h

Working Hours	900h ± 55h	50€ / h	45000 € - 47750€

Profit margin



Parts Price	Consumer Price	Profit	Devices until profit
75€	200 €	125 €	382

Capacity

What do we need?	Restrictions?
6x Teensy 4.0 microcontroller 6x Teensy audio shields 6x Displays 12x Midi Ports 6x Electret Condenser Microphones 6x 128M-Bit Flash Memories 24 x TS ¼" Jacks 24 x 10k linear Potis 6 x Rotary Encoders 6x 8:1 Analog Multiplexer	We are planning to order the parts this week (29.03- 03.04.)
5x Media technology students/ engineers	One Student is missing for two weeks (31.3 -16.4)
Tools for communication and data exchange	Tools are implementet and ready to use