Group 1
Project Proposal

1. Executive Summary

This document outlines a proposal for the design, testing, and manufacture of a complete dual boot system based on the specifications required by the EDC and Synful computing. The proposed system is a Desktop computer with the capability and upgradeability to fulfill the specifications. All deviations from the specifications have been justified in the relevant sections. Also outlined below is the fully costed plan, with a shipping schedule and milestones to fulfill the initial order for 2000 machines to EDC and a further 1165 devices ready for public sale within the required timeframe and budget.

2. Development Methodology

This project will adopt the waterfall methodology for the hardware and the agile methodology for the software phases. The agile methodology is an iterative, flexible approach; however, the waterfall methodology is more structured with a defined plan and less flexibility (Andrei et al., 2019).

Once agreed, the hardware design is expensive and time-consuming to change, which, given the limited budget and timescales, should be avoided. This phase follows a defined plan and is unlikely to change. Therefore, the waterfall

methodology is suitable. It also allows easier collaboration between teams working in parallel.

The software can, and should be adapted as issues arise. The agile methodology will allow continuous development of the software through an iterative approach.

3. Requirements

3.1. Table of Requirements

The requirements are listed in **Table 1**. Deviations from the original specifications with justifications are shown in **Table 2**.

Table 1. List of Requirements

Requirements	Chosen Option and Description
Hardware	
Board	A83-S
CPU	68k0
Glue Chips (ULAs)	
G1	Glue IOP-CPU
G2	Glue RAM-CPU
G3	Glue DISP-CPU
G4	Glue SYSTEM
GDISP	XVX
Misc	Resistors, caps, etc
ROMS	32KB
	8KB
RAM	2x 256KB = 512KB

I/O chips	
IOP-J 1	SC150
IOP-J 2	SC100
INTSND	i8042
Storage	2 x 3.5" floppy drives
Keyboard	Internal keyboard for case
Case	Desktop
Total Weight	< 2 Kg: **No batteries**
Software	
OS with country and character set support	HB/OS in ROM 1 - kernel, libs & drivers
	McROM for full BDS system in ROM 2
	MCC Kernel, sources, libraries, core utils, extensions, sound, graphics & drivers
HWCFG app	In-house in ROM 1
Design only (Software Purchased separately)*	
Programming language	C via Vi and PCC compiler
Office Suite	EZ-Suite

3.2. Deviations from specification and justifications

Table 2. Deviations from Specifications

Specification	Proposed Design	Justification
Portable/Luggable form factor	Desktop	• Reduce costs. • Reduces weight.
Built-in display	No built-in display	• Reduce costs. • Not portable therefore obsolete. • Not compatible with the proposed case. • External display provides higher resolution.
Battery powered	No battery	• Reduce costs. • Not portable therefore obsolete. • Reduces weight.

Networking capability	SC100 chip fitted however no software stack.	● Reduce costs. ● Software stack provided by a third party. ● HW/SW compatible therefore upgradeable.
EZ-Suite and programming language	Upgradeable but not bundled	● Reduce costs. ● HW/SW compatible therefore upgradeable

3.3. Assumptions and limitations

3.2.1. Assumptions

- The requirements will not change until the delivery.
- Customers would prefer a desktop over limited battery life.
- Customers would be willing to use an external monitor.
- Customers would appreciate the compatibility with third-party applications.
- A selling price of £470 is competitive given the provided features, compatibility, and upgradability.
- EDC will accept the delivery of the computers in three batches.

3.2.2. Limitations

- The maximum cost of one unit is capped at £250.
- The units must be ready for sale in 13 months.
- The networking software stack is not provided.
- The limited number of internal resources.

3.4. Gherkin specifications of the key requirements

Gerkin specifications for hardware and software compatibility, upgradability, and multitasking are shown in **Appendix 6.1**.

4. Project Plan and Proposed Deliverables

4.1. Resources list, Components, and Estimation of Cost and Effort

A breakdown of the overheads and components until the device is ready for production is shown in **Tables 4 and 5**. A detailed view of the calculations can be viewed on this link.

Table 4. Resources Plan, Cost, and Estimation of Efforts

Role	Type	Count	Person Weeks	Actual Weeks	Cost/Day	Total Cost
HW Architects	Agency	16	42	21	£400.00	£84,000.00
HW Engineers	Agency	8	10.5	10.5	£275.00	£14,437.50
SW Architects	Internal	1	2	2	£300.00	£3,000.00
	Agency	8	35	22.5	£450.00	£78,750.00
SW Engineers	Internal	2	4.1	2.2	£195.00	£3,997.50
	Agency	10	65.8	33.8	£295.00	£97,055.00
Project Analyst	Agency	1	13	13	£250.00	£16,250.00
Project Manager	Internal	1	39	39	£275.00	£53,625.00
	Total	**47**	**211.4**	**144**	**Total Overheads**	**£351,115.00**
Internal costs and indirect costs incurred by using internal resources.					**Internal Costs**	**£60,622.50**
					Overheads - Internal Costs	**£290,492.50**

Table 5. Cost of Hardware and Software Components	
Role	**Cost**
Total cost of hardware components/computer	£206.000
MccOS kernel and resources - Freely copyable (£ 50) / all computers (One-time purchase)	£50.000

4.2. Delivery and Selling Plan

The delivery and selling will be divided into three to support the fulfillment of the agreement without incurring any debts (**Table 6**). Income generation will increase rapidly after that as the total overheads and internal costs of design will have been covered by then.

Table 6. Proposed Delivery and Selling Plan		
First Batch (965 Devices)	**Budget**	**£500,000.00**
	Total Overheads-Internal costs	-£290,492.50
	Components cost	-£198,740.00
	Available fund	**£10,767.50**
	Ship 500 to EDC	✅
	Sell 465 (£470 unit price)	**£218,550.00**
	Available fund	**£229,317.50**
Second Batch (1000 Device)	**Components cost**	-£206,000.00
	Available fund	**£23,317.50**
	Ship 500 to EDC	✅
	Sell 500 (£470 unit price)	**£235,000.00**

	Available fund	**£258,317.50**
Third Batch (1200 Device)	**Components cost**	-£247,200.00
	Available fund	**£11,117.50**
	Ship 1000 to EDC	✅
	Sell 200 (£470 unit price)	**£93,000.00**
	Available fund	**£104,117.50**
	Internal costs	-£60,622.50
	Net profit	**£43,495.00**

4.3. Work Breakdown Structure, Milestones, and Project Schedule (13 month total)

The Initial unit and early system tests are expected to be accounted for in the hardware and software building tasks; the remaining testing time shown in the Gantt charts (**Appendix 6.2**) is dedicated to integration tests, security tests, and UAT, which is close to what Brooks (1995) recommended.

4.4. Risk Plan

Table 7. Risk Register

Risk	Likelihood	Impact	Severity	Owner	Actions
Needs/goals not defined				PM	Implement design plan.
Scheduling errors				PM	Define schedule
Project delays				RM/PM	Allocate extra time
Customer refuses/changes requirements				RM	Increase communication, all parties sign requirements
Staff loss/training				RM	Allocate time for internal training
Market price decrease				PA	Accepted
Obsolete design				Engineer	Research new designs
Acts of God				PM	Accepted
Theft				PM	Accepted

5. References

Andrei, B. A., Casu-Pop, A. C., Gheorghe, S. C., Bolangiu, C. A. (2019) A study on using waterfall and agile methods in software project management. Journal of Information Systems and Operations Management 13(1): 125-135.

Frederick P., Brooks (1995) The Mythical Man-Month (Anniversary Edition). Available from: https://archive.org/details/MythicalManMonth/page/n19/mode/2up [Accessed 24 May 2023].

6. Appendix

6.1. Gherkin Specifications of Key Requirements

6.1.1. **Feature:** CPU Forward Compatibility

Scenario: The CPU has forward compatibility

Given The computer is supplied with Motorola 68k series

When Synful Computing plans for CPU upgrades in future models

Then The code previously written should be compatible with the new Motorola CPU

6.1.2. **Feature:** Upgradability with socketed components

Scenario: A user wants to upgrade their machine

Given The computer has a board with sockets (e.g., A83-S)

When The user plans to upgrade with a pin-compatible component to meet their future needs

Then The user should be able to swap the old component with a new one without the need for professional service or the need to change the board

6.1.3. **Feature:** Multitasking

Scenario: A user wants to run multiple applications

Given The computer has 512Kb of ram

When The user needs to work on multiple applications

Then The user should be able to run several applications simultaneously without lagging

6.1.4. **Feature**: EZ-Office Suite Compatibility

Scenario: A user wants to run EZ-Office suite applications

Given The computer has HB/OS ROM installed

AND The computer has the HWCFG in ROM

When The user buys an EZ-Office suite

AND The user boots to the in-house HB/OS

Then The user should be able to use EZ-Office applications

6.1.5. **Feature**: GUI Compatibility

Scenario: A user wants to upgrade to a GUI operating system

Given The computer has support for the OS

AND The computer has a port to connect a mouse to

When The user upgrades to the new OS

Then The user should be able to use the new GUI operating system effectively

6.1.6. **Feature**: Networking Capability

Scenario: A user wants to use networking functionality

Given The computer has an SC100 chip

AND The user purchases networking software stack from a third-party provider

AND The user installs the networking stack

When The computer should allow for networking with other computers and devices

6.2. Gantt Charts

Three Gantt charts were ordered from the least detailed to the most detailed.

For Hardware Order/Delivery From Manufacturer:-

We assume each batch takes ten days to be delivered from the manufacturer. These components do not require any design. The first batch will be ordered immediately with the seed money given by the EDC, which is 500,000 pounds. The second and third batches will only be ordered after selling the assembled computers from the previous batch.

Prototype Testing:-

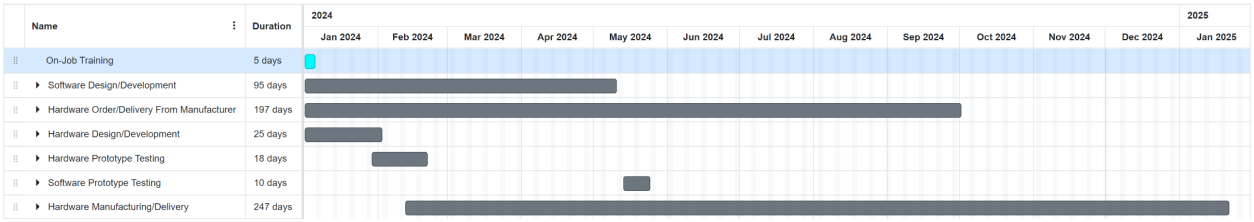
We will start testing the prototype once the motherboard design is finished. By the time the motherboard design is finished, the other components design, such as ULAs, and ROM, would be ready. We assume it takes zero days to manufacture the prototype motherboard. The Software Integration Testing and User Acceptance Testing begin as soon as the Software Design/Development is done.

Hardware Manufacturing/Delivery:-

We start manufacturing the motherboard and case as soon as the hardware prototyping is done. Since the brief did not specify the manufacturing time for the motherboard and case,we assume we can manufacture 100 units per day for both the motherboard and case. Once the manufacturing is done, we assume a five-day delivery time from the manufacturer to the assembly warehouse.

The document mentioned a build capacity for each case of 20 units per day. From our understanding, build capacity means assembling the computer in the case. In addition, the document also mentions a board production capacity of 25 units per day. Again, from our understanding, that is the time it takes to assemble the motherboard in the case. So, since we cannot assemble a computer without a case, we chose 20 computers assembled per day from our understanding of the document.

Regarding delivery of the final product to the EDC, we assume a five-day shipping and delivery period. In addition, we assume the same amount of time to sell the rest of the units to the public.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2024
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Apr 2024
May 2024
Jun 2024
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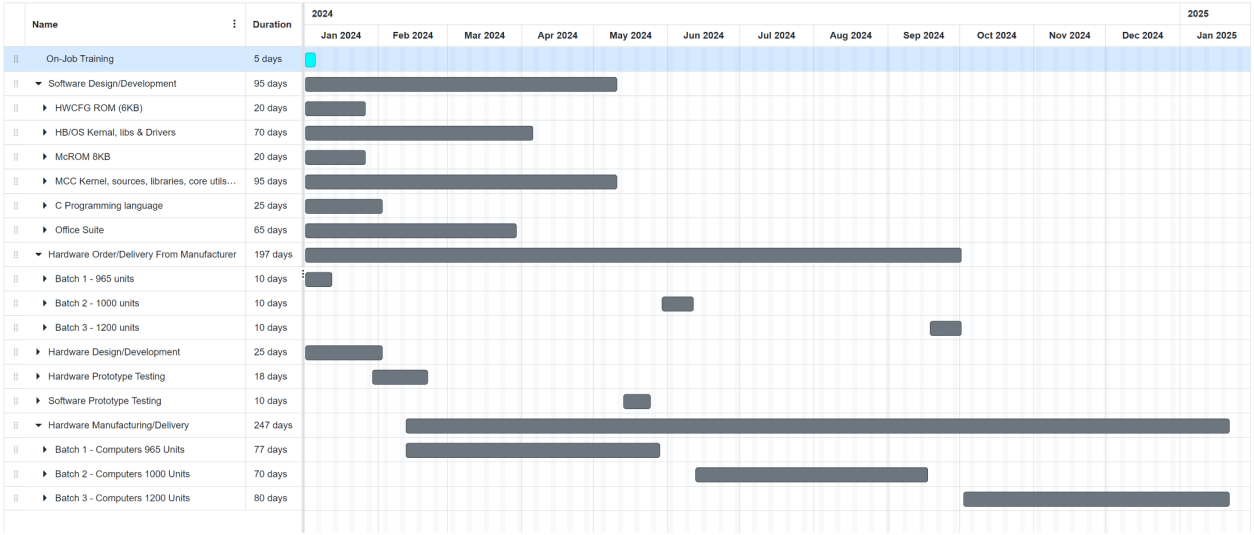
Aug 2024
Sep 2024
Oct 2024
Nov 2024
Dec 2024
Jan 2025
On-Job Training 5 days
Software Design/Development 95 days
Hardware Order/Delivery From Manufacturer 197 days
Hardware Design/Development 25 days
Hardware Prototype Testing 18 days
Software Prototype Testing 10 days
Hardware Manufacturing/Delivery 247 days


Name
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2024
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Oct 2024
Nov 2024
Dec 2024
Jan 2025
On-Job Training 5 days
Software Design/Development 95 days
HWCFG ROM (6KB) 20 days
HB/OS Kernal, libs & Drivers 70 days
McROM 8KB 20 days
MCC Kernel, sources, libraries, core utils… 95 days
C Programming language 25 days
Office Suite 65 days
Hardware Order/Delivery From Manufacturer 197 days
Batch 1 - 965 units 10 days
Batch 2 - 1000 units 10 days
Batch 3 - 1200 units 10 days
Hardware Design/Development 25 days
Hardware Prototype Testing 18 days
Software Prototype Testing 10 days
Hardware Manufacturing/Delivery 247 days
Batch 1 - Computers 965 Units 77 days
Batch 2 - Computers 1000 Units 70 days
Batch 3 - Computers 1200 Units 80 days