System Design and Delivery Proposal

Module 6 Assignment 1, Part 1. Group 3. University of Essex Online

1. Introduction

This document presents the design of a dual-boot system, tailored to meet the specifications and requirements provided by **English Digital Computers (EDC)**, while utilizing the capabilities of **Synful Computing (SC)**. It offers a detailed breakdown of the comprehensive costs associated with assembling the system components and outlines the requisite resources to achieve the target of delivering 2000 computers to EDC. Simultaneously, it addresses the goal of providing a number of units to the public at a competitive price. This strategic approach allows Synful Computing to generate the necessary capital to fulfil the agreed-upon number of systems for EDC, all within the allocated budget and timeframe. Furthermore, a budgeted delivery plan that supports this strategy will be provided in the following sections.

2. Methodology

The Agile methodology, characterized by its iterative, flexible, and customer-centric approach, emerges as a potent strategy for the development of the Synputer, particularly when navigating through the multifaceted and dynamic landscape of technology and user expectations (Cohen, Lindvall & Costa, 2004). The Synputer, with its intricate specifications underscores a scenario where adaptability and continuous improvement are paramount (Project Management Case Study, 2023).

Embracing the Agile methodology for the Synputer project is particularly compelling when considering the inherent complexity, associated risks, and risk management challenges for the Synputer. These are addressed in Agile through its continuous testing and feedback loops, ensuring that potential issues are identified and rectified in the early stages of development, thereby mitigating the likelihood of escalated problems in the later phases (Wysocki, 2014). Not only will this mitigate risks but ensures the product aligns seamlessly with customer feedback, where expectations are pivotal and subject to change.

The agile methodology also stands as a pivotal strategy in navigating constraints of a limited budget while addressing project requirements (Szynski, 2021). Agile emphasizes iterative development, where features are delivered in manageable increments, allowing for flexibility in adapting to changes without extensive cost implications. This approach not only ensures that funding can be allocated more efficiently across different stages of the project but also significantly reduces the financial risk associated with traditional fixed-scope projects. Furthermore, through continuous stakeholder engagement, the Agile process aligns development closely with EDC's expectations and feedback, ensuring that the project remains focused on the most value-generating features and adjustments can be made early in the development process as necessary to meet budgetary constraints.

Functionally, agile sprints will be 2 weeks in length with a review at the end of each sprint. A larger governance cycle consists of three sprints, or 6 weeks in length too. The additional governance structure is designed to help mitigate risk. At the end of each 6 week cycle, project analysts are allocated time to review and estimate progress and reorientate the project if large deviations from the plan are required. It could be extremely costly to redesign large portions of the plan at a more frequent rate. The 2 week sprints give freedom for development teams to adjust their approach and maintain Agile principles, but large deviations need approval. A secondary purpose of the governance structure is to encourage the formation of project artifacts. Development teams are encouraged to spend a 2:1:3 split of time to design:implementation:testing tasks, fitting the 6 week cycles. Opportunities for project artifacts arise from design and on completion of testing. Therefore development teams will find benefit from dedicating sprints to types of tasks that result in project artifacts.

3. EDC Requirements

The following sections provide the hardware and software specifications that have been mutually agreed upon, as discussed in the transcript between EDC and Synful Computing.

3.1. EDC Hardware and Software Requirements

Table 1 - EDC Hardware Requirement List	
Component	**Specification From BOM**
CPU (forward compatibility)	68k0
3oard	A83-S
ROM 1	8KB
ROM 2	32KB
RAM (512kb)	X2 256KB
NTSND	i8042
GDISP (4" display + external display port)	XVX
I/O Chip (Connects Various Input / Output Devices)	OP-J + IOP-J-2
MISC	Resistors, Caps, etc
Case (Portable)	Luggable
Storage (Pre-installed / Expansion)	3.5'' floppy
Weight	2 Kgs
Battery	2 Hrs

Table 2 - EDC Software Requirement List

Component	Specification From BOM
OS - ROM 1	SC HB:K,L,D, HWcfg, Boot ldr
OS - ROM 2	MCC: McROM MCC: K,L,D,E,S,G
Programming	C via Vi and the PCC
Business Suite	EZ-System: EZ-Suite

3.2 Assumptions, Limitations and Deviations

A. <u>Assumptions</u>

a. According to the market demands, the selling price of **£ 399** provides a competitive range given the features of the proposed system.

b. Given the priorities of EDC’s main consumers (corporate), customers will prefer the limitation on the battery life to be removed.

c. A delivery plan of 2 batches is needed to supplement EDC with agreed number of devices as well as continue to remain profitable

B. <u>Limitations</u>

a. Limited budget of **£500,000.**

b. Limited In-house resources.

c. Limited EDC agreed cost of **£250.**

d. Limited delivery plan of **13** months.

C. <u>Deviations</u>

Table 3 - Deviations From Specifications

Requirements	Alternative Design	Justifications
Hardware Specifications		
Display	No Display. Can be purchased independently	1. Reduction in cost. 2. Low risks associated with display faults.

		3. Customers can still connect to an external display.
Portability	Stationary. Desktop case.	1. Reduction in cost 2. Unlimited battery life 3. Reduces weight.
I/O: sc150	Integrated keyboard and ports in the Desktop case.	4. Reduction in cost
Software Specifications		
Programming	Not included in the system	1. Reduction in cost. 2. Compatible and upgradeable
Networking	No Software available	1. Compatible and upgradable
Business Suite	Not included in the system	2. Reduction in cost. 3. Compatible and upgradeable

3.3. Gherkin Specifications

All Gherkin statements can be found in the appendix, section 5.1

4. Project Resource Management, Cost breakdown, Selling, and Delivery Plan.

A detailed documentation of the cost analysis can be found here.

4.1. Human Resources Estimate

Below are the costs of human resources over the full 13 months that the project is planned to cover. More details of the work schedule can be found in section 4.4. A portion of the cost is dedicated to meeting the minimum requirements of the project contributing to a ‘cost per system’, calculated in section 4.2 along with manufacturing costs. Additional work slots are reserved for risk mitigation.

Table 4 - Estimated Total Resources				
Role	**# of Employee**	**Cost / Day**	**Total Days**	**Total Cost**
Hardware Architect (inhouse)	1	£ 250	115	£ 28,750

Software Architect (inhouse)	1	£ 300	155	£ 46,500
Hardware Engineer (inhouse)	2	£ 175	136	£ 47,600
Software Engineer (inhouse)	2	£ 195	96	£ 37,440
Hardware Engineer (agency)	1	£ 275	136	£ 37,400
Software Engineer (agency)	1	£ 295	96	£ 28,320
Project Manager	1	£ 275	48	£ 13,200
Project Analyst	1	£ 250	32	£ 8,000
Total	**10**			**£ 247,210**

4.2: Estimated Costs

Table 5 - Estimated Costs	
Cost per 2000 systems	**Total**
Total Cost of Resources	£ 52,848.84
Total Cost of HW and SW	£ 412,000.00
Total Cost Per 1 System	£ 231.99
Grand Total	**£ 463,986.51**

4.3: Delivery Plan & Revenue Breakdown

The delivery plan is structured in two batches, with a specific allocation of units in each batch designed to generate sales revenue, ensuring profitability. This arrangement entails that EDC will receive the total number of systems in two installments, each consisting of 1000 units. Furthermore, it is anticipated that Synfull

Computing will successfully sell 500 systems within the agreed timeframe. Notably, a significant increase in revenue generation is expected following the second batch.

Table 6 - Delivery Plan, Cost and Revenue Breakdown	
Batch 1	**1500**
Current Budget	£ 500,000.00
Total Cost of Systems	£ 347,989.89
Remaining budget	£ 152,010.12
Selling price	£ 399.00
Quantity Delivered to EDC	**1000**
Quantity sold	**500**
Revenue	£ 199,500.00
Available budget	**£ 351,510.12**

Batch 2	**1500**
Current Budget	£ 351,510.12
Total Cost of Systems	£ 347,989.89
Remaining budget	£ 3,520.23
Selling price	£ 399.00
Quantity Delivered to EDC	**1000**
Quantity sold	**500**
Revenue	£ 199,500.00
Available budget	**£ 203,020.23**

4.4: Task Schedule

The schedule consists of three key phases: the requirements, build, and delivery phases. After the initial 3 weeks requirements phase, the project enters the build phase which is split into eight 6-week cycles. Each cycle consists of 65 days of hardware work, and 55 days of software work. The system will be fully prototyped after 160 days of hardware work, and 115 days of software work. That means manufacturing can begin in the 4th build cycle. Manufacturing all the systems will take an additional 150 days of work. At this point, the project manager can begin focusing on delivery tasks. Batches of systems are scheduled to be moved at the end of build cycle 6 and 8.

Gantt chart found here (download and open it in Microsoft Excel to view timeline).

Milestone description	Assigned to	Work Days	Total Days
Requirements Phase (3 weeks)			
Requirements Gathering	Project Manager	Week 1-2	8
Requirements Reporting	Project Manager	Week 3	4
Software Requirements Reviewing	Software Architect	1 day per week	3
Hardware requirements Reviewing	Hardware Architect	1 day per week	3
Build Phase (6 week cycles)(x8)			
Software Designing	Software Architect	Week 1-2	8
Hardware Designing	Hardware Architect	Week 1-2	8
Software Design Reviewing	Software Engineer (x3)	End of Week 2	3
Hardware Design Reviewing	Hardware Engineer (x3)	End of Week 2	3
Software Implementing	Software Architect	Week 3	5
Hardware Engineering	Hardware Engineer (x3)	Week 3	15
Hardware Fault Finding	Hardware Architect	Week 4	5
Software Fault Finding	Software Architect	Week 4	5
Software Progress Reviewing	Software Engineer (x3)	End of Week 4	3
Hardware Progress Reviewing	Hardware Engineer (x3)	End of Week 4	3
Software Integration Testing	Software Engineer (x3)	Week 5-6	30

Hardware Integration Testing	Hardware Engineer (x3)	Week 5-6	30
Hardware Testing Review	Hardware Architect	End of Week 6	1
Software Testing Review	Software Architect	End of Week 6	1
Progress Reporting	Project Manager	Every 2 weeks	3
Replanning and Resourcing	Project Analyst	Every 2 weeks	3
Stage Costing	Project Analyst	End of week 6	1
Delivery Phase (3 weeks)			
Delivery Managing	Project Manager	Weeks 1-3	12

4.5: Risk Analysis

In conducting a thorough risk assessment for the Synputer project, we utilized the well-established framework provided by the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK). This methodology is critical in ensuring a standardized, systematic approach to identifying, analyzing, and responding to project risks, thereby enhancing reliability and comprehensiveness in our risk management process (Project Management Institute, 2017).

#	Risk Description	Impact	Likelihood	Mitigating Strategies	Risk that remains after mitigation	Risk Owner	Source
1	Limited software compatibility	High (8/10)	High (8/10)	Collaborate with developers to port popular apps, create an IBM PC/DOS compatibility layer.	Likelihood: Medium (4/10) Impact: Medium (5/10)	Software Architect / Software Engineer	(IBM, 2016)
2	Product specifications not aligning with market expectations.	High (9/10)	High (9/10)	Use agile methods for market testing, and plan iterative hardware releases aligned with customer expectations.	Likelihood: Medium (5/10) Impact: Medium (5/10)	Marketing / Project Manager	(Intellipaat, 2023)
3	System limitations hindering performance and development capabilities by users	High (7/10)	Medium (6/10)	Optimize the OS and software for system constraints, provide comprehensive user support and documentation, and hardware expansion.	Likelihood: Low (3/10) Impact: Medium (4/10)	Software Architect / Software Engineer	(Nielsen Norman Group, 2020)
4	Reliance on external parties for critical system upgrades and functionalities.	Medium (6/10)	Medium (5/10)	Secure legal agreements with third parties for timely support, invest in developing critical in-house components, and maintain backup vendors for reliability.	Likelihood: Low (2/10) Impact: Low (2/10)	Project Manager / Project Analyst	(ZDNet, 2021)

5	Risk of potential patent infringement, theft of trade secrets, or unauthorized replication of software or hardware design.	High (8/10)	Medium (6/10)	Perform an IP audit for asset protection, stakeholders sign NDAs, monitor infringements	Likelihood: Low (3/10) Impact: Medium (4/10)	Project Manager	(LinkedIn, 2023)
6	Risks associated with the availability of skilled staff	High (7/10)	Medium (6/10)	Detailed HR planning for project stages, partner with staffing agencies for a consistent talent supply and contingency recruitment, cross-training to prevent bottlenecks.	Likelihood: Low (3/10) Impact: Medium (4/10)	Project Manager	(Knowledge Hut, 2023)
7	The risk of missing crucial project deadlines due to unforeseen challenges, scope changes, or resource constraints	High (8/10)	High (8/10)	Use PMBOK for schedule management with realistic timelines and buffers, regularly track progress to detect delays, and incorporate risk responses into the schedule for potential disruptions.	Likelihood: Medium (4/10) Impact: Medium (5/10)	Project Manager	(PMBOK, 2009)
8	Sales batches fail to achieve the targets.	High (8/10)	Medium (6/10)	Use PMBOK guidelines for market research and sales forecasting, implement strong marketing strategies before batch releases, and create feedback loops to address sales performance issues.	Likelihood: Low (3/10) Impact: Medium (4/10)	Project Manager / Project Analyst / Marketing	(PMBOK, 1987)

5. Appendix

5.1 Gherkin Statements

1. Feature: CPU with forward compatibility
Scenario: New software is released
Given that the system has a CPU When new software is released in the future Then the CPU should support that software
Scenario: New hardware is added to the system
Given that the system has a CPU When a hardware component is added or changed

Then the CPU should recognise it
Scenario: The CPU fails to run new software
Given that the CPU is forward-compatible When the system experiences compatibility issues Then it should be fixable by patching CPU drivers
2. Feature: Industry-standard storage
Scenario: Data is stored on the system
Given that the system has storage When the user attempts to save a file in an industry-standard format Then the system should store it on its storage successfully
3. Feature: 512kb RAM
Scenario: General RAM requirement
Given that the motherboard supports RAM When the system is built Then at least 512kb RAM should be installed
Scenario: The system operates with 512kb of RAM
Given that the system has 512kb of RAM When software is opened on the system Then all of the system's 512kb of RAM should be usable by said software
4. Feature: Industry-compatible OS
Scenario: The user wants to run third-party software
Given that the OS is installed correctly When the user attempts to run third-party software Then it should execute successfully on the system's OS
5. Feature: Full business-suite software
Scenario: The user wants to create a document
Given that the user is logged into the system And double-clicks on the word processor When the user opens a new document And types on the keyboard to assign a name Then a new document with said name should be created
Scenario: The user wants to process financial data
Given that the user is logged into the system And double-clicks on the spreadsheet software When the user opens a new spreadsheet

And enters financial data Then the user should be able to perform calculations
6. Feature: Hyperbasic programming support
Scenario: Hyperbasic is rolled out
Given that the phase 2 update is installed When the user writes a script using Hyperbasic And executes the script on the system Then the script should run successfully
7. Feature: Ports for external hardware support
Scenario: The user plugs in a centronic printer
Given that the system has an available port When the user plugs a printer into the system Then the system should recognise the printer And the user should be able to print using said printer
Scenario: The user plugs in an external keyboard
Given that the system has an available port When the user plugs a keyboard into the system Then the system should recognize the keyboard And the user should be able to type using the keyboard

5.2 Cost Breakdown

A preview of the cost breakdown for the project; the full version is available here. .

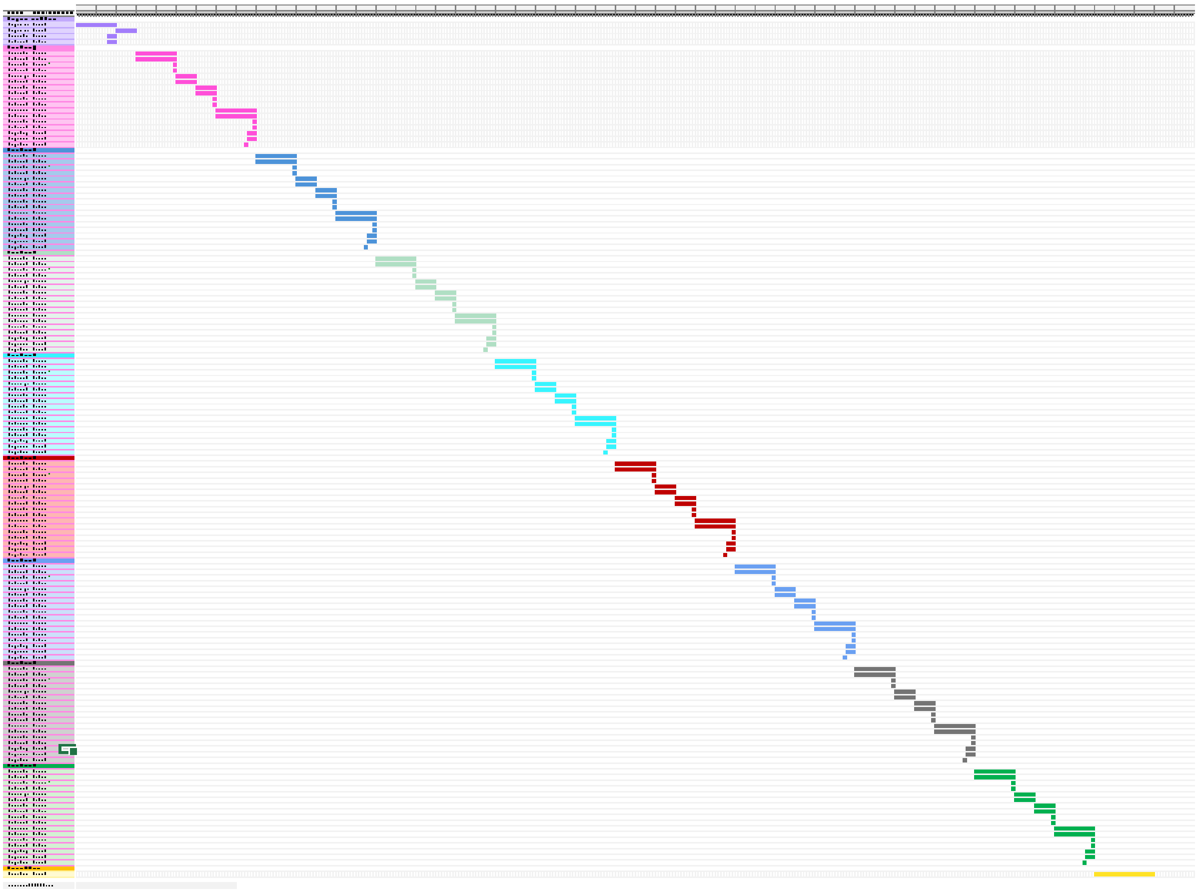
SYSTEM REQUIRMENTS (EDC)													
	COMPONENTS						RESOURCES (Planning)						
Component	Type	Count	Unit Price + Manuf. Cost	Sub Total	(Person Weeks)	Total Duration (Days)	Role	Count / Task	Type	Total Duration (Days)	Duration of (Days Worked in Cycle HWA:29% - SWA:44%)	AVA. Cost/Day	Sub Total Per System
CPU	68K0	1.00	£ 8.00	£ 8.00	0.00	0.00	-	-	-	-	0.00	€ -	£ -
Board	A83-S	1.00	£ 39.00	£ 39.00	8.00	40.00	Hardware Architect	1.00	In-House	40.00	11.60	€ 250.00	£ 1.45
ROM	8Kb	1.00	£ 1.50	£ 1.50	4.00	20.00	Hardware Architect	1.00	In-House	20.00	5.80	€ 250.00	£ 0.73
	32Kb	1.00	£ 4.00	£ 4.00	4.00	20.00	Hardware Architect	1.00	In-House	20.00	5.80	€ 250.00	£ 0.73
RAM	256KB	2.00	£ 5.00	£ 10.00	0.00	0.00	-	-	-	-	0.00	€ -	£ -
INTSND	i8042	1.00	£ 1.50	£ 1.50	0.00	0.00	-	-	-	-	0.00	€ -	£ -
GDISP	XVX	1.00	£ -	£ -	0.00	0.00	-	-	-	-	0.00	€ -	£ -
MISC	Resistors, Caps..	100.00	£ 0.50	£ 50.00	0.00	0.00	-	-	-	-	0.00	€ -	£ -
I/O	sc100	1.00	£ 12.00	£ 12.00	0.00	0.00	-	-	-	-	0.00	€ -	£ -
	sc150	1.00	£ -	£ -	0.00	0.00	-	-	-	-	0.00	€ -	£ -
ULA	G1	1.00	£ 5.00	£ 5.00	4.00	20.00	Hardware Architect	1.00	In-House	20.00	5.80	€ 250.00	£ 0.73
	G2	1.00	£ 5.00	£ 5.00	4.00	20.00	Hardware Architect	1.00	In-House	20.00	5.80	€ 250.00	£ 0.73
	G3	1.00	£ 5.00	£ 5.00	4.00	20.00	Hardware Architect	1.00	In-House	20.00	5.80	€ 250.00	£ 0.73
	G4	1.00	£ 5.00	£ 5.00	4.00	20.00	Hardware Architect	1.00	In-House	20.00	5.80	€ 250.00	£ 0.73
Case	Desktop	1.00	£ 45.00	£ 45.00	0.00	0.00	-	-	-	-	0.00	€ -	£ -
Storage	3.5" Floppy	2.00	£ 7.50	£ 15.00	0.00	0.00	-	-	-	-	0.00	€ -	£ -
Sub Total				£ 206.00	32.00			1.00			46.40	€ 11,600.00	£ 5.80
OS	Synful HB/OS , Kernel, Libs..	1.00	£ -	£ -	8.00		Software Architect	1.00	In-House	40.00	17.60	€ 300.00	£ 2.64
	Synful HWCFG	1.00	£ -	£ -	2.00		Software Architect	1.00	In-House	10.00	4.40	€ 300.00	£ 0.66
	MCC-McRom, Kennel,Libs,Langs...	1.00	£ -	£ -	13.00		Software Architect	1.00	In-House	65.00	28.60	€ 300.00	£ 4.29
Softwares	EZ-SYS - EZ Suit	1.00	£ -	£ -	0.00		-	-	-	-	0.00	€ -	£ -
Sub Total				£ -	23.00			1.00			50.60	€ 15,180.00	£ 7.59

To	
Total Resources	10.00
Total Required Days	247.07
Total Cost Of Resources in (2000) Systems	£ 52,848.84
Total Cost Of HW + SW in (2000) Systems	£ 412,000.00
Total Cost Per System	£ 231.99
Total Cost Of 1 Batch (1500) System	£ 347,989.89
Grand Total Of (2000) Systems	£ 463,986.51
Limitations and Diviations From The Requirement Highlighted In RED	

RESOURCES (Managerial)						RESOURCES (Managerial)					
Role	Count / Task	Type	Duration	AVA. Cost/Day	Sub Total Per System	Role	Count / Task	Type	Duration	AVA. Cost/Day	Sub Total Per System
Project Manager	0.50	In-house	24.00	£ 275.00	£ 1.65	Project Analyst	0.50	Agency	16.00	£ 250.00	£ 1.00
	0.50		24.00	£ 6,600.00	£ 1.65		0.50		16.00	£ 4,000.00	£ 1.00
Project Manager	0.50	In-house	24.00	£ 275.00	£ 1.65	Project Analyst	0.50	Agency	16.00	£ 250.00	£ 1.00
	0.50		24.00	£ 6,600.00	£ 1.65		0.50		16.00	£ 4,000.00	£ 1.00

5.3 Gantt Chart

A preview of the Gantt chart for the project; with the full chart available here.



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