

Course: HND Electrical and Electronic Engineering
Module: SGDM5021 – Business Management
Assignment Title: Business Resources
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Date Submitted: 07/03/2025
Word Count: 2473 words

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Summary

This assignment firstly involved focusing on a global steel manufacturer TATA Steel and analysing the micro and macro-economics affecting its operations along with its operations that effect local communities, employees and the rest of the world, such as their transition to EAF technology. An evaluation was done on TATA Steel to identify the strengths and weaknesses in the company along with the opportunities for growth and sustainability. Additionally, a project was conducted, identifying a critical path for 30 days with 15 employees and reworking the schedule down to 9 people whilst not extending the project beyond an additional 4 days. Two depreciation methods were then analysed including straight-line depreciation and accelerating depreciation method and comparing which asset suits which method, with both production machinery and delivery vehicles better suiting the accelerating depreciation method. Two different companies were also compared by analysing their different expenditures even though they had the same profit. Company A was the better choice to invest in, vastly due to their asset value and likelihood of automated process. Finally, a breakeven analysis was done to compare internally producing and outsourcing ball valves. The breakeven point was 5760 units which was then profitable. Internal manufacturing had a higher profit over 5 years compared to outsourcing with a £100,000 higher difference making it the better solution.

Task 1 – Company Introduction and Marketplace

TATA Steel is a manufacturing company that makes steel. It is a global company but one of their main sites of operations is in Port Talbot, manufacturing strip products. They have transport links to Trostre and also Newport. This company is influenced by several microeconomic factors that can affect its costs, production speed, and supply. Its marketplace includes:

- The automotive industry providing steel to car bodies.
- Packaging for food and beverage cans
- The construction industry

Micro-Economic Factors that impact TATA Steel Port Talbot Operations:

Changes in production – An example of this is the new Electric Arc Furnace (EAF) furnace project. Due to the changes in the production process, involving the closure of heavy end operations, the company has seen a massive offload of employees, an estimate of 2,800 job losses (MetalMiner, 2024). This amount of job losses will impact the local community by reducing household incomes which will cause financial strain on families in the local area. The community's wages could potentially lose £200 million in wages according to the stark conclusion of new research for BBC Wales (nation.cymru, 2024).

Market Competition – This is also another microeconomic factor that affects TATA Steel's operations. An example of this is the oversupply of global steel production. China has increased its steel production, which has lowered global steel prices, which intensifies competition for the Port Talbot Steelworks. TATA Steel is also limited to production supply due to its change in operations, as explained above. The global industry is said to have 543m tonnes in excess of steel which is 70 times more than the UK consumes in a year (TheGuardian, 2024). With a production of 29.5 million tonnes in 2023, TATA Steel is among the top producers of steel which shows how competitive the steel market is when compared with other companies (worldsteel, n.d.). The decrease in steel prices will cause customers to buy from different steel companies which will result in a lack of need of steel being bought from Port Talbot, which can potentially cause TATA Steel to lose money from lack of production, which will again have the domino effect on employees, local contractors and local businesses.

Macro-Economic Factors that impact TATA Steel Port Talbot Operations:

Environmental Regulations – This is a macro-economic factor that is greatly impacting TATA steel, especially its Port Talbot plant in the UK. It can also cause micro-economic factors, such as changes in production processes as explained previously. Environmental regulations are pressuring companies to find ways to reduce carbon emissions and due to the sheer amount of carbon emissions TATA Steel Port Talbot produced when it had two blast furnaces running, making up for 2.08% of the total UK carbon emissions according to (Sinclair, 2022). Environmental regulations have already impacted TATA Steel by ceasing heavy end operations and slowing down production. TATA Steel could also potentially face fines to the Dutch government if they do not significantly reduce its emissions from the Ijmuiden plant within the next 12 months. This has also impacted the local area as its plant is linked with higher lung cancer rates and reduced life expectancy in the area (Business Standard Private Ltd, 2024).

Taxation and Financial Legislation – This is also a macro-economic factor that affects TATA Steel. India's Supreme Court has encouraged the authority of state governments to levy additional taxes on mineral extraction. This ruling could raise operational costs for Tata Steel and other mining companies, as they may be required to pay backdated taxes dating back to 2005, spread over a 12-year period starting in 2026. Fitch Ratings has warned that this could impact the EBITDA margins of the companies involved (Arora, 2024).

The business was evaluated using a SWOT and Pest analysis tool, which can be seen below and on the next page:

Table 1 - SWOT Analysis

Strengths: • One of the top global steel producers with a production of 29.5 million tonnes in 2023 (worldsteel, n.d.). • New EAF furnace which will reduce carbon emissions by 90% for the whole steelmaking plant (TATA Steel, n.d.). • 2-2.5mt/year in UK scrap to be steel used for steelmaking (TATA Steel, n.d.). • Raw materials to be 75% sourced from UK (TATA Steel, n.d.).	Weaknesses: • Tata Steel has faced environmental fines, such as the €27 million penalty for violations at its IJmuiden plant (Business Standard Private Ltd, 2024). • An estimate of 2,800 job losses due to EAF project (MetalMiner, 2024).
Opportunities: • Opportunities to collaborate with new local suppliers due to need for scrap supply chain (TATA Steel, n.d.). • Celtic Freeport Project which is expected to attract investment and infrastructure, and transport could improve flow of materials for TATA Steel products and improve their supply chain (UK Government, n.d.).	Threats: • Ruling by India's Supreme Court on additional taxes for mineral extraction could raise operational costs for Tata Steel (Arora, 2024). • The community's wages could potentially lose £200 million due to job losses (nation.cymru, 2024).

Table 2 - PEST Analysis

Political	• Government support of £500m to invest into EAF project (BBC, 2024). • Commitment to net zero target of carbon emissions of 2050 leading to increased regulatory pressures other industries to reduce their carbon footprint. (TATA Steel UK, 2023).
Economic	• Transition into EAF technology leading to 2,800 job losses due to higher efficiency and reduced labour costs (MetalMiner, 2024). • High energy costs pose challenge to production due to EAF requiring a lot of energy (Majid, 2024).
Social	• Community being affected. Local business rely on Port Talbot steelworks to maintain their businesses along with local contractors. EAF project raises concerns in this regard and draw uncertainty to local communities (nation.cymru, 2024).
Technical	• Transition to EAF technology represents significant modernisation in steel production and more environmentally friendly.

Mission and Vision Statements:

Some of TATA Steel UK's mission and vision statements include the following:

1. *"We are committed to improving the quality of life of the communities we serve. We do this by striving for leadership and global competitiveness in the business sectors in which we operate. Our practice of returning to society what we earn evokes trust among consumers, employees, shareholders and the community."*
2. *"That is why we are building the leading UK steel business, one which is sustainable in every sense: sustainable in how we operate, sustainable in the products and services we make and source, and in how we take responsibility for the world around us."*
3. *"We conduct research programmes aimed at developing cutting-edge manufacturing and product technology and at improving the sustainability of steel products through their life cycles"*

(TATA Steel UK, n.d.a)

The SWOT analysis and PEST analysis have some reflective aspects in TATA Steel's mission and vision statements. Statement 1 shows their commitment to local communities and their customers even though local communities could suffer from the impact of the implementation of EAF technology this is reflected in the social aspect of the PEST analysis and one of the weaknesses in the SWOT analysis.

Statement 2 highlights their drive to sustainability. The SWOT and PEST analysis both reflect this by highlighting TATA Steel's commitment to net zero targets, reduction of emissions and collaborating with new suppliers.

Statement 3 comments about TATA Steel's innovation in manufacturing technologies and product technologies along with the sustainability of their steel products. The technical aspect of the PEST analysis reflects this by highlighting the modernisation in steel production with EAF technology.

Based on the SWOT and PEST analysis, TATA Steel's long term Vision Statement over a 10-year period could be would most likely stay the same, as TATA already drive innovation, sustainability and still aim to return to communities along with focusing on the customer.

Organisational Structure:

TATA Steel Port Talbot has a hierarchical structure, similar to as shown below:

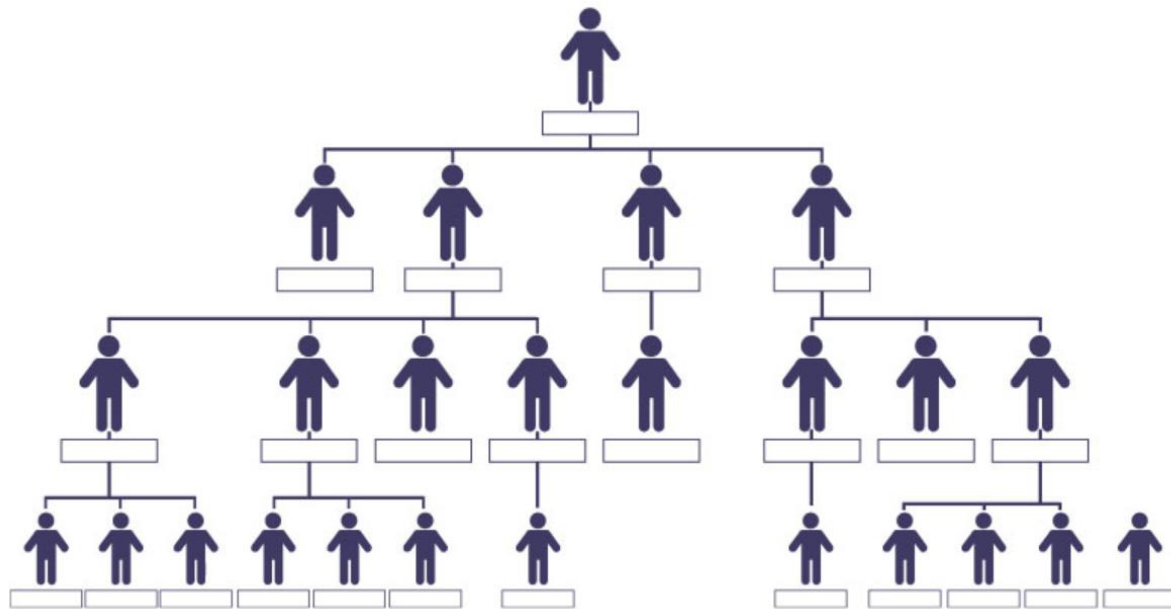


Figure 1 - Organisational Structure Example (Miller, 2022)

The CEO would be at the top. Underneath there would be a board of directors which expands into other hierarchies. Port Talbot in particular has a COO in the same hierarchy of the board of directors. The COO will then have works managers for different workplace areas. Underneath the works manager hierarchy will then be the heads of different departments within that area, such as head of engineering, head of manufacturing etc. Under head of engineering would be engineers for different departments and under these would be staff, such as electricians, technicians, mechanical fitters etc.

Knowing all of the above, it is important for customers to know the organisational structures in order for them to know who to contact.

Task 2 – Project Management

A project was to be managed first using the table below to create a network diagram and identify the critical path:

Table 3 – Project Tasks

Tasks Label	Duration (Days)	Predecessors	Persons Required
A	4	-	1
B	5	-	2
C	7	-	1
D	3	-	2
E	3	A	2
F	5	A	2
G	4	E	1
H	3	F	3
I	5	F	2
J	2	B, F	4
K	5	G, H	3
L	7	I, J	3
M	6	D	2
N	4	C, L	4
O	3	I, J	2
P	4	M	2
Q	3	K, N, O	3
R	2	P, Q	4

1. Manually Drawn Network Diagram:

The manually drawn network diagram can then be seen below with the identified critical path:

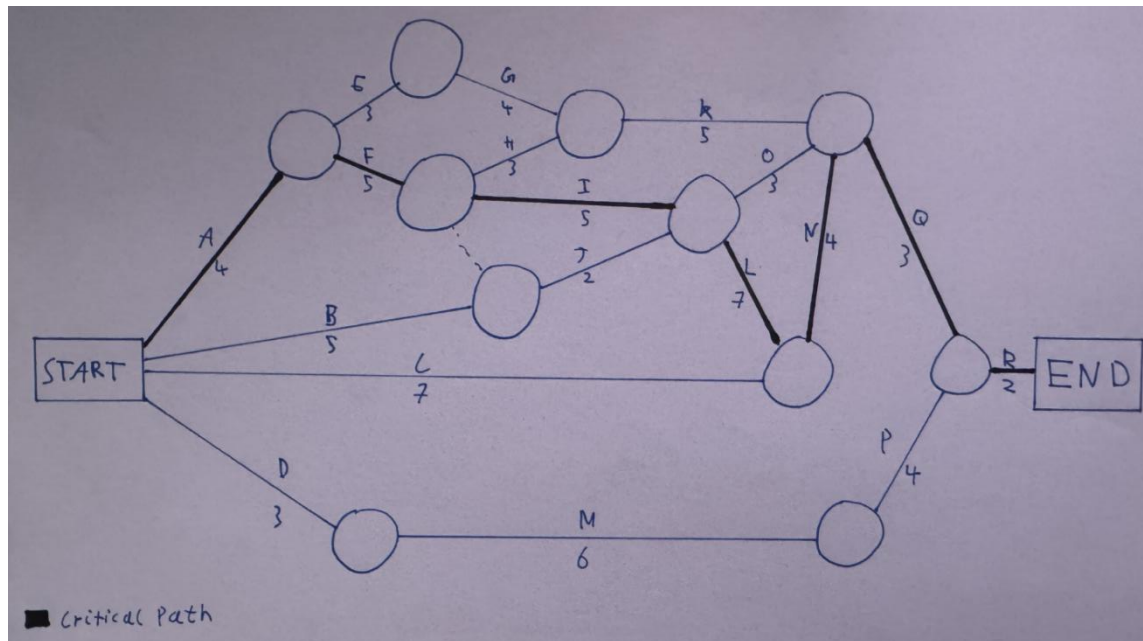


Figure 2 – AoA Network Diagram

The critical was identified to be A → F → I → L → N → Q → R which a duration of $4+5+5+7+4+3+2 = 30$ days.

(See appendix table 4 for EST, LST, EFT, LFT and slack).

2. i) Project Baseline:

An electronic analysis was performed also using table 3 to create an initial network diagram which includes EST, LST, EFT, LFT and shows the CP and Slack, which is attached to the report.

Below shows the initial baseline table with names assigned to the tasks with the Gantt chart:



Figure 3 - Initial Baseline Table and Gantt Chart

The Gantt chart also shows the critical path with the names of people assigned to each task along with areas of slack.

▷ William	56 hrs
▷ Kai	56 hrs
▷ Zeeshan	48 hrs
▷ Rob	96 hrs
▷ Jon	208 hrs
▷ Elliot	240 hrs
▷ Muhammad	128 hrs
▷ Nick	112 hrs
▷ Ben	80 hrs
▷ Dave	96 hrs
▷ Simon	88 hrs
▷ Ashley	32 hrs
▷ Mike	40 hrs
▷ James	32 hrs
▷ Luke	40 hrs

The initial team shows 15 people all around with some doing less hours than others.

Figure 4 - Initial Team of 15 people

The current statistics show that the duration of the project lasts 30 days which aligns with the manually drawn network diagram in figure 2:

	Start	Finish	
Current	Thu 13/02/25	Wed 26/03/25	
Baseline	Thu 13/02/25	Wed 26/03/25	
Actual	NA	NA	
Variance	0d	0d	

	Duration	Work	Cost
Current	30d	1,352h	£0.00
Baseline	30d	1,352h	£0.00
Actual	0d	0h	£0.00
Remaining	30d	1,352h	£0.00

Figure 5 - Current Statistics

The team planner resource sheet was used to see who is not providing may hours and taken off tasks. Task hours were then spread out manually using this resource. Below shows the people and hours before and after the changes were made:

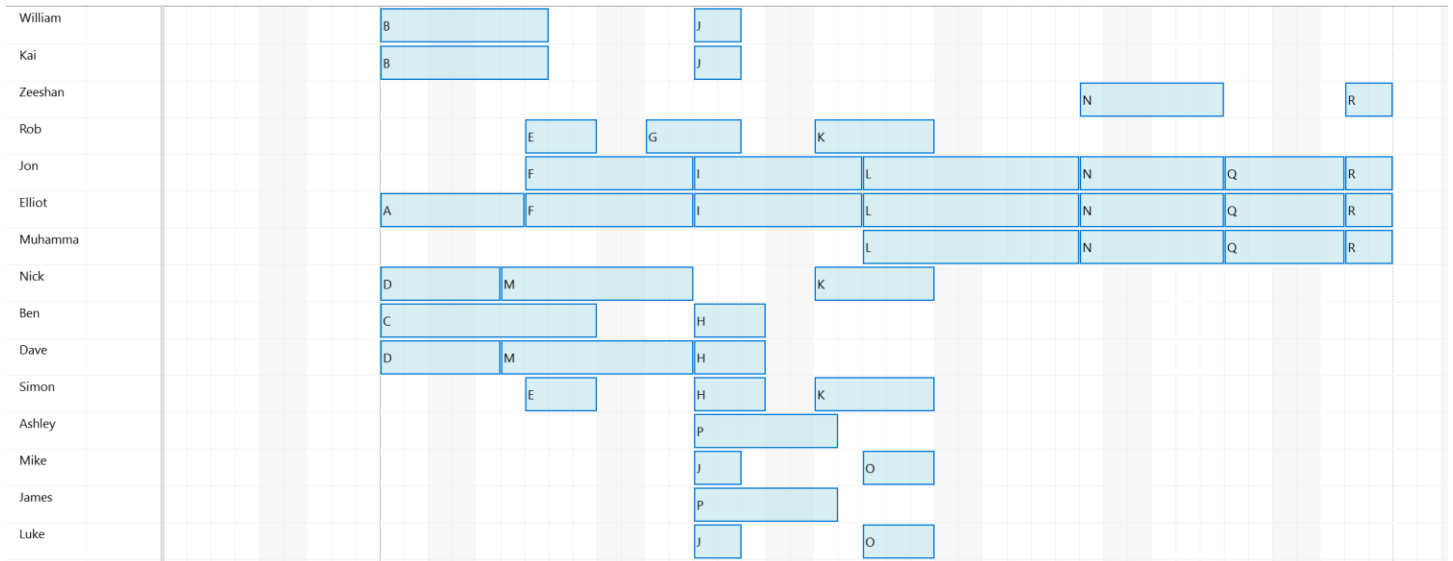


Figure 6 - Team Planner Before Changes

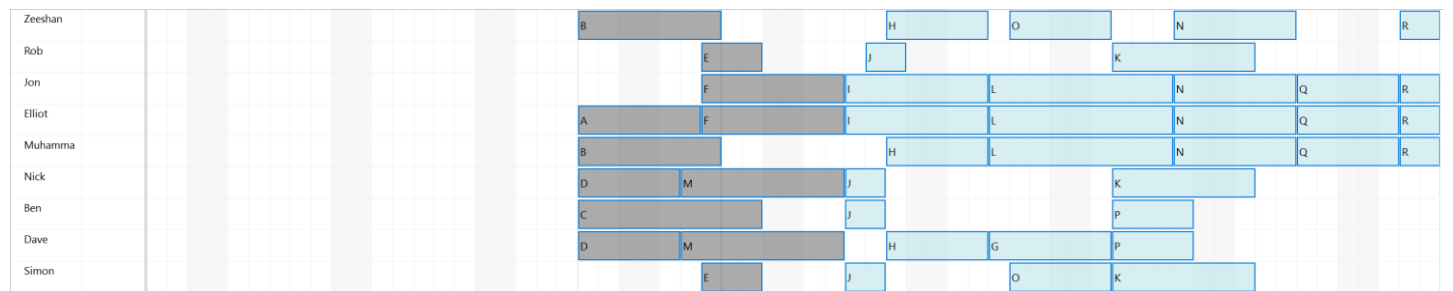


Figure 7 - Team Planner After Changes

ii) New Baseline:

Another Gantt chart and network diagram were then made with less people completing the tasks without delaying the project more than four days. The hours were kept the same but spread among 9 people instead of 15, without interfering with the critical path and adjusting other tasks within the identified slack. Conflicts were manually resolved. The tasks were assigned accordingly as shown below along with the new Gantt chart:

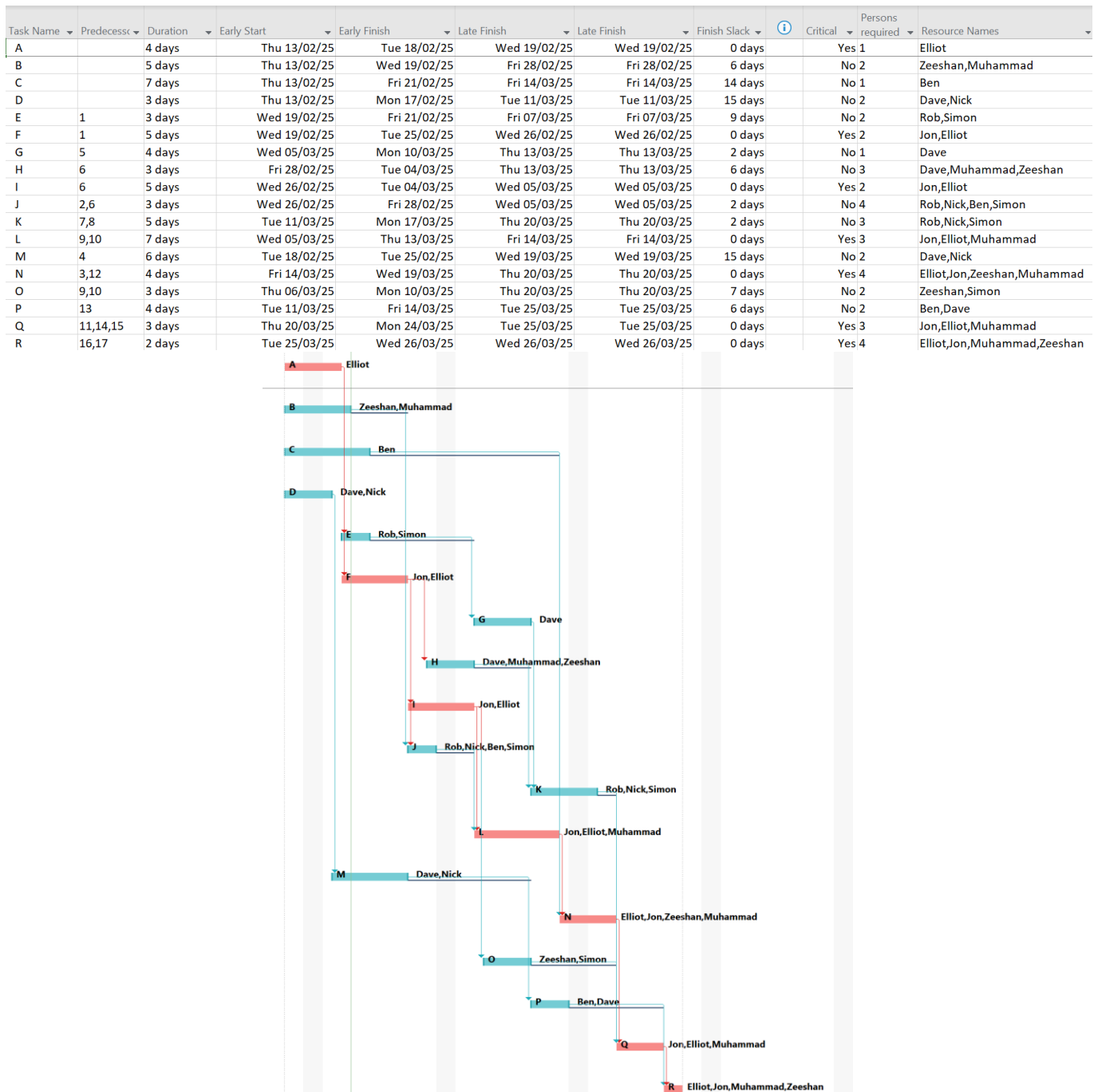


Figure 8 - New Baseline and Gantt Chart

Below then shows that the project wasn't extended beyond 30 days, and the hours have stayed the same, but distributed among 9 people instead of 15.

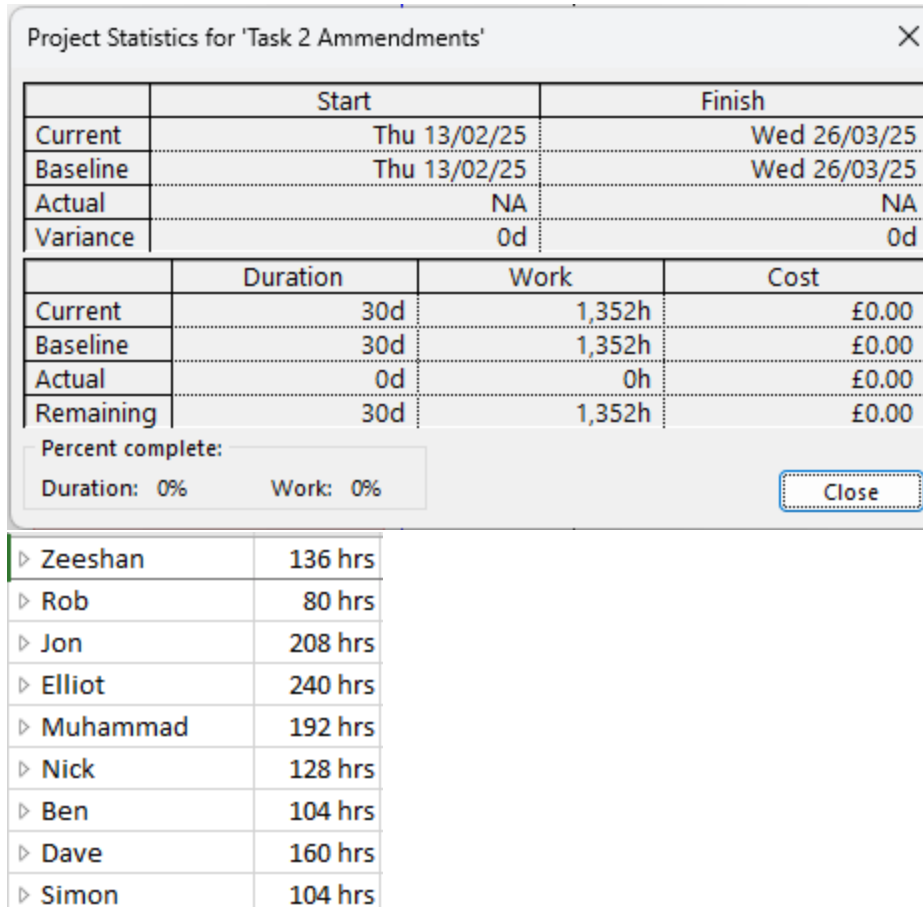


Figure 9 - New Statistics and Hours

The new electronic network diagram can be seen attached to the report.

Task 3 – Financial Depreciation

1. Definition:

Financial depreciation is a practice of spreading the physical cost of a company asset over its usable life and companies will depreciate assets for accounting and tax purposes. Due to the high expense of machinery and equipment, the cost is spread out for a number of years equal to the life of the asset. This allows companies to write off the value of an asset over a time period for tax purposes (Tuovila, 2024).

Depreciation is recognised as an expense which is non-cash which reduces the company's net income, and the accumulated amount of depreciation is added to a contra account on a balance sheet reducing the gross value of reported fixed assets (Investopedia, 2025).

2. Depreciation Calculation:

A company has two options for calculating depreciation. Both methods will be used to determine which is best suitable for a scenario of two asset types, which are production machinery and delivery vehicles.

Straight Line Method:

The percentage depreciation rate (19%) of the initial value of assets is subtracted from it, which gives the value of the asset after one year (£153,900). For the next year 19% of the initial value (£190,000), which is £36,100 is then subtracted from the current year's value of assets (£153,900), which calculates to be £117,800. This process continues for each year which gives it a steady decrease.

Straight Line Depreciation		19%
Year	Residual Value	Depreciation @ 19%
0	190000	36100
1	153900	36100
2	117800	36100
3	81700	36100

Figure 11 - Straight Line Depreciation Spreadsheet Calculation

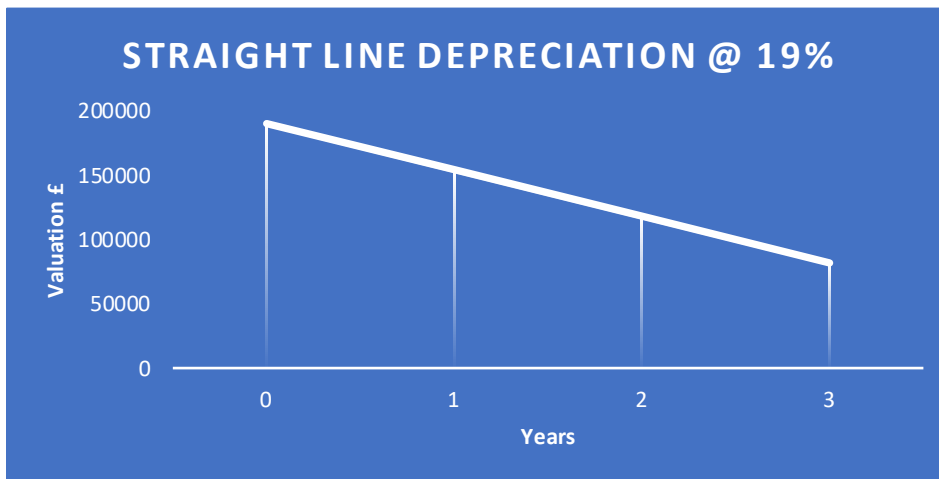


Figure 10 - Straight Line Depreciation Graph

Accelerating Depreciation Method:

Unlike the Straight-Line method, the subtracted depreciation number decreases every year, creating an exponential curve. Instead of taking 23% of the starting value every year and subtracting it from the current value, the depreciation value is taken from the current year for every year. For example, 23% of year 1's residual value calculated to be £33,649, in which at year 2, the residual value will be £146,300 - £33,649 = £112,651

Net Book Value @ 23%		
Year	Residual Value	Depreciation @ 23%
0	190000	43700
1	146300	33649
2	112651	25910
3	86741.27	19950

Figure 12 – Accelerating Depreciation Method Spreadsheet Calculation

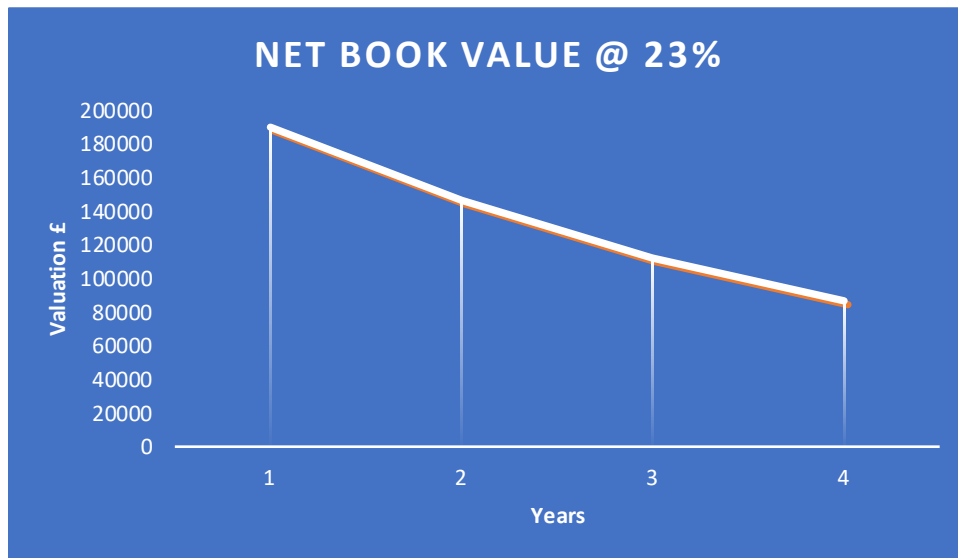


Figure 13 – Accelerating Depreciation Graph

Conclusions and Recommendations:

From production machinery, it is evident that the straight-line method has better consistency, making calculations more predictable and overall value retention. However, this method does not factor in the costs for maintenance of machinery and usage patterns. The accelerating depreciation method may be more suited for this as the machinery may not depreciate at a steady rate.

The straight-line method may not also suit delivery vehicle assets due to vehicles rapidly depreciating, especially when new. There are also a lot of factors that add to this, which includes mileage (which could be high especially on delivery vehicles) and their overall condition. The straight-line method wouldn't take this into account and may overstate their book value, which makes the accelerating depreciation method the more realistic choice (Arnold Clark, 2024).

3. Company Comparison:

The table below shows two companies which perform differently but attain the same gross profit:

Cost of production		
	Company A	Company B
Sales Revenue	£3,000,000	£3,000,000
Less cost of sales		
Plant depreciation	£700,000	£450,000
Production labour	£650,000	£850,000
Materials	£650,000	£700,000
Gross Profit	£1,000,000	£1,000,000

Figure 14 - Company A and B Comparison

Analysis:

From the results above, it can be seen that both companies have an identical gross profit of £1,000,000 and their cost of sales differ. When comparing their plant depreciation, company A has much higher depreciation costs which indicates they invest more in their production machinery. They also spend less on labour which could indicate company A is more automated, which could save their costs in the long run, whereas company B relies more on labour costs, spending £200,000 more on labour than company A, which could add risk to the company if the wage cost increases. Company B also has slightly higher materials costs which could indicate there is less efficiency in production, such as wasted materials or poor procurement.

Company A is likely to attain future investment due to automation and if machines are efficiently maintained, they could last longer and lead to higher gross profits overtime. Company A would be the better company to invest in due to being efficient with labour and materials costs.

Task 4 - Manufacturing

A decision was to be made whether to internally manufacture ball valves at £145/unit or outsource for £135/set at a rate of 10,000 units per annum to an automotive supplier based on the table below:

Annual cost information	
Marginal costs:	
Direct labour	£355 000
Direct materials	£760 000
Variable overheads (power)	£52 000
Fixed overheads:	
Rent/rates	£88 000
Administration	£75 000

Figure 15 - Annual Cost Information

1. Break Even Analysis:

A break-even analysis was done with the cost of ball valves being manufactured internally at £145/unit.

The table below shows the break-even point is at 5,760 units with variable cost being £116.70/unit.

The calculations are as follows and were implemented in the table following, then processed through a spreadsheet:

$$\text{Unit cost} = \text{Total Marginal costs} / \text{units per annum} = £1,167,000 / 10000 = £116.70$$

$$\text{Fixed costs} = \text{Rent} + \text{administration} = £88,000 + £75,000 = £163,000$$

$$\text{Revenue} = \text{Unit cost} \times \text{no. of units}$$

$$\text{Total cost} = \text{Fixed cost} + (\text{variable costs} \times \text{no. of units})$$

$$\text{Profit} = (\text{unit costs} \times \text{no. of units}) - \text{fixed costs}$$

Break Even Chart							
Units	Revenue	Fixed Costs	Unit cost	Variable Cost	Total Cost	Profit	Break Even
500	72500	163000	145	116.7	221350	-148850	5760
1000	145000	163000	145	116.7	279700	-134700	
1500	217500	163000	145	116.7	338050	-120550	
2000	290000	163000	145	116.7	396400	-106400	
2500	362500	163000	145	116.7	454750	-92250	
3000	435000	163000	145	116.7	513100	-78100	
3500	507500	163000	145	116.7	571450	-63950	
4000	580000	163000	145	116.7	629800	-49800	
4500	652500	163000	145	116.7	688150	-35650	
5000	725000	163000	145	116.7	746500	-21500	
5500	797500	163000	145	116.7	804850	-7350	
6000	870000	163000	145	116.7	863200	6800	
6500	942500	163000	145	116.7	921550	20950	
7000	1015000	163000	145	116.7	979900	35100	
7500	1087500	163000	145	116.7	1038250	49250	
8000	1160000	163000	145	116.7	1096600	63400	
8500	1232500	163000	145	116.7	1154950	77550	
9000	1305000	163000	145	116.7	1213300	91700	
9500	1377500	163000	145	116.7	1271650	105850	
10000	1450000	163000	145	116.7	1330000	120000	

Figure 16 - Break Even Table

The breakeven chart below shows the crossover point between revenue and total cost, which is the breakeven point:

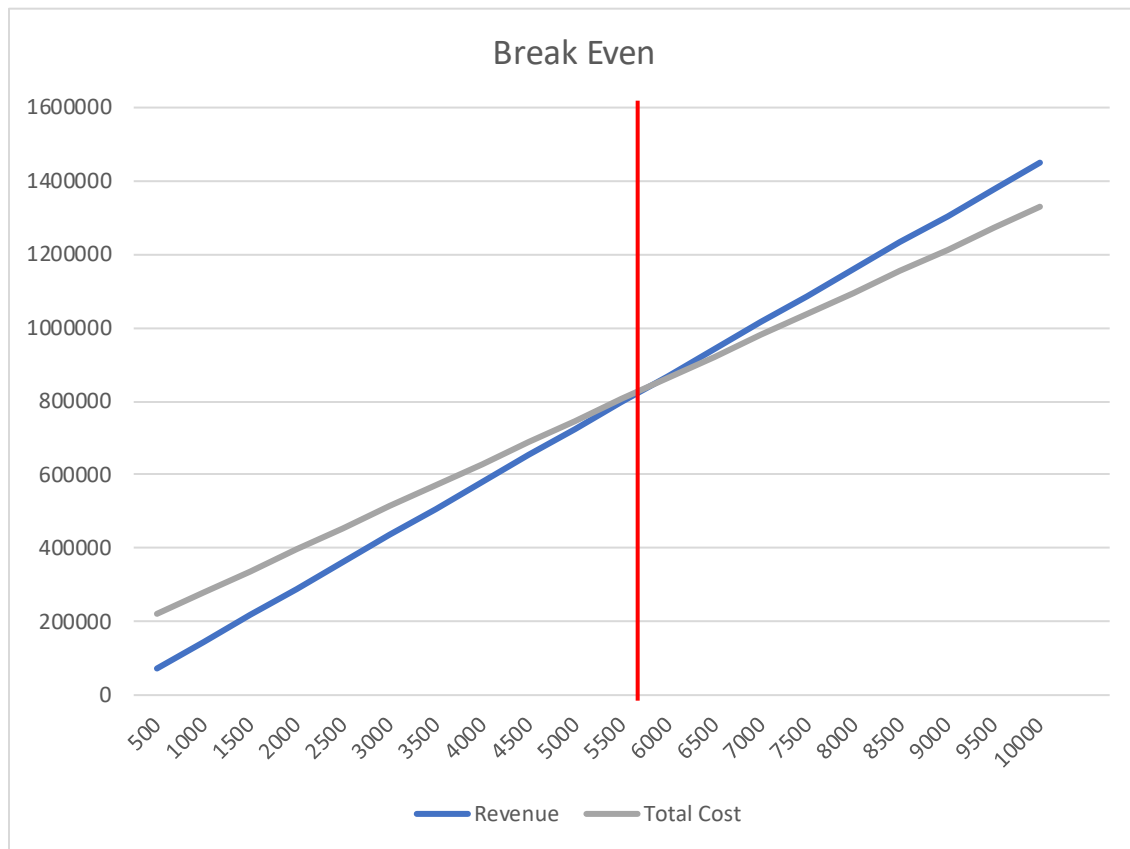


Figure 17 – Break Even Chart (£145/unit)

2. Contribution Ratio:

The contribution ratio was also calculated with sales volumes at 5,000, 7,000 and 9,000 units per annum.

The contribution sales ratio calculated to be 19.5%, which is $\frac{(\text{unit cost} - \text{variable cost})}{\text{unit cost}} \times 100$

Contribution Ratio							
Unit Cost	145						
Variable Cost	116.7						
Contribution Ratio =	<u>Unit Cost - Variable Cost</u>		=	19.52%			
	Unit Cost						
Volumes							
5000		-21500					
7000		35100					
9000		91700					

Figure 18 - Contribution Sales Volumes Calculations

$$\text{Contribution sales volumes} = \text{no. of units} \times \text{unit price} \times \text{contribution ratio} - \text{fixed costs}$$

The volumes for 5,000, 7,000 and 9,000 can be seen above.

Production level at 5,000 is not viable as there is a loss of £21,500, which makes 7,000 units per annum viable, as a profit is made of £35,100.

3. Profit Difference:

The total profit difference over 5 years was calculated for both internally resourcing and outsourcing.

The total profit for both methods were calculated by multiplying their annual profit by 5, which can be seen below:

	Number of Years	Profit per yr	Profit
Internal	5	120000	600000
External	5	100000	500000
Difference			100000

Figure 19 - Profit Difference

The profit difference calculated to be £100,000, with the internal method profiting higher, therefore it is better to manufacture internally.

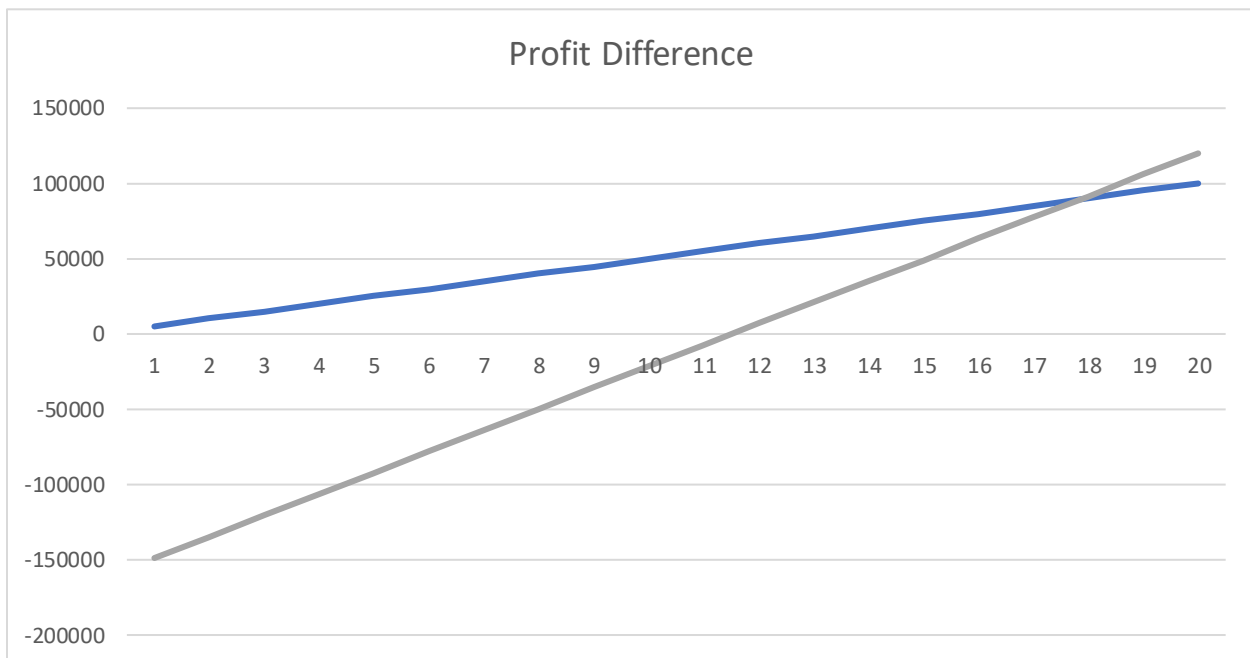


Figure 20 - Profit Difference Chart

4. Outsourcing Risk Evaluation:

There are various risks when choosing to outsource manufacturing. One of these is loss of control, which means a degree of control is lost over production and handed to the other manufacturer. Another risk is quality control, in which the outsourcing company may have different quality standards. There could also be hidden costs, such as tariff changes or currency fluctuations.

These measures can be mitigated by clearly defining expectations with the other manufacturer ensuring quality standards and timelines are detailed. Potential hidden costs should also be discussed with the manufacturer beforehand, and a quote can be requested to provide detailed expenses. Where quality control issues could arise, this could be mitigated by conducting regular inspections and evaluations throughout the process to ensure quality control issues are mitigated. An example of this would be requesting quality data from the manufacturer.

(Johnson, n.d.).

Boeing also suffered with outsourced manufacturers having quality control issues with the 787 Dreamliner Project, which faced delays due to over-reliance on outsourced components and costed them \$20Billion due to supply chain disruptions.

(multuscopententia, n.d.)

Works Cited

Arnold Clark, 2024. *Car depreciation – everything you need to know*. [Online]

Available at: <https://www.arnoldclark.com/blog/selling/car-depreciation#:~:text=A%20car's%20depreciation%20in%20value,be%20around%2010%25%2D15%25>.

[Accessed 27th February 2025].

Arora, N., 2024. *Indian mining, steelmakers' operating costs could surge after top court ruling, says Fitch Ratings*. [Online]

Available at: <https://www.reuters.com/world/india/indian-mining-steelmakers-operating-costs-could-surge-after-top-court-ruling-2024-08-19/>

[Accessed 25th January 2025].

BBC, 2024. *Ministers set to agree £500m Tata Steel subsidy*. [Online]

Available at: <https://www.bbc.co.uk/news/articles/c0jp0v77231o>

[Accessed 30th January 2025].

Business Standard Private Ltd, 2024. *Tata Steel Netherlands faces fines of almost 27 mn euros over emissions*. [Online]

Available at: https://www.business-standard.com/companies/news/tata-steel-netherlands-faces-fines-of-almost-27-mn-euros-over-emissions-124122001411_1.html

[Accessed 25th January 2025].

Investopedia, 2025. *Accumulated Depreciation vs. Depreciation Expense: What's the Difference?*. [Online]

Available at: <https://www.investopedia.com/ask/answers/040215/what-relationship-between-accumulated-depreciation-and-depreciation-expense.asp#:~:text=Depreciation%20expense%20is%20recognized%20on,value%20of%20fixed%20assets%20reported>.

[Accessed 20th February 2025].

Johnson, S., n.d. *Top 7 Risks of Outsourcing (And How to Prevent Them)*. [Online]
Available at: <https://www.weareamnet.com/blog/risks-of-outsourcing>
[Accessed 3rd March 2025].

Majid, A., 2024. *High energy prices threaten the future of the UK steel industry*. [Online]
Available at: <https://www.thechemicalengineer.com/news/high-energy-prices-threaten-the-future-of-the-uk-steel-industry/>
[Accessed 30th January 2025].

MetalMiner, 2024. *Tata Steel's High-Stakes Bet: £500M Government-Backed Plan to Modernize Port Talbot*. [Online]
Available at: <https://agmetalminer.com/2024/09/19/steel-industry-leader-tata-port-talbot/>
[Accessed 23rd January 2025].

Miller, K., 2022. *Introduction to Hierarchical Organizational Structure*. [Online]
Available at: <https://crowjack.com/blog/strategy/organizational-structures/hierarchical>
[Accessed 5th February 2025].

multuscopententia, n.d. *Boeing Dreamliner Case Study: Impact of Poor Supply Chain Visibility and Collaboration..* [Online]
Available at: <https://multuscompetentia.com/boeing-dreamliner-case-study-impact-of-poor-supply-chain-visibility-and-collaboration/>
[Accessed 3rd March 2025].

nation.cymru, 2024. *Research shows ‘devastating’ impact of closing Port Talbot’s blast furnaces.* [Online]
Available at: <https://nation.cymru/news/research-shows-devastating-impact-of-closing-port-talbots-blast-furnaces/#:~:text=Research%20shows%20'devastating'%20impact%20of%20closing%20Port%20Talbot's%20blast%20furnaces,-26%20Jun%202024&text=The%20closure%20of%20the%20blas>
[Accessed 23rd January 2025].

Sinclair, T., 2022. *Port Talbot produces the most CO2 emissions in the UK.* [Online]
Available at: <https://www.herald.wales/south-wales/neath/port-talbot-produces-the-most-co2-emissions-in-the-uk%EF%BF%BC/>
[Accessed 25th January 2025].

TATA Steel UK, 2023. *tata-steel-uk-sustainability-report-2021-2023.* [Online]
Available at: <https://www.tatasteeluk.com/sites/default/files/tata-steel-uk-sustainability-report-2021-2023.pdf>
[Accessed 30th January 2025].

TATA Steel UK, n.d.a. *Our mission is to build the leading UK steel business that is sustainable in every sense.* [Online]
Available at: <https://www.tatasteeluk.com/about-us/our-strategy#:~:text=We%20are%20committed%20to%20improving,employees%2C%20shareholders%20and%20the%20community.>
[Accessed 30th January 2025].

TATA Steel, n.d. *Our plan to transform the UK business.* [Online]
Available at: <https://www.tatasteeluk.com/green-steel-future>
[Accessed 25th January 2025].

TheGuardian, 2024. *UK steel industry calls for protectionist measures over glut driven by China*. [Online]

Available at: <https://www.theguardian.com/business/2024/oct/07/uk-steel-industry-calls-for-protectionist-measures-over-glut-driven-by-china?>

[Accessed 23rd January 2025].

Tuovila, A., 2024. *Depreciation: Definition and Types, With Calculation Examples*. [Online]

Available at: <https://www.investopedia.com/terms/d/depreciation.asp>

[Accessed 20th February 2025].

UK Government, n.d. *Investment opportunity*. [Online]

Available at: <https://chatgpt.com/c/6794c56a-dfe0-8006-8194-46863c00ffa0>

[Accessed 25th January 2025].

worldsteel, n.d. *Top steel-producing companies 2023/2022*. [Online]

Available at: <https://worldsteel.org/data/top-producers/>

[Accessed 23rd January 2025].

Appendix

Table 4 - Table for EST, LST, EFT, LFT and Slack

Tasks Label	Duration (Days)	Predecessors	Persons Required	EST	EFT	LST	LFT	Slack
A	4	-	1	0	4	0	0	0
B	5	-	2	0	5	7	7	7
C	7	-	1	0	7	14	14	14
D	3	-	2	0	3	15	15	15
E	3	A	2	4	7	13	9	9
F	5	A	2	4	9	4	0	0
G	4	E	1	7	11	16	9	9
H	3	F	3	9	12	17	8	8
I	5	F	2	9	14	9	0	0
J	2	B, F	4	9	11	12	3	3
K	5	G, H	3	12	17	20	8	8
L	7	I, J	3	14	21	14	0	0
M	6	D	2	3	9	18	15	15
N	4	C, L	4	21	25	21	0	0
O	3	I, J	2	14	17	22	8	8
P	4	M	2	9	13	24	15	15
Q	3	K, N, O	3	25	28	25	0	0
R	2	P, Q	4	28	30	28	0	0