Developing Apple Vision Pro

BPES Project Management



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1 Introduction

In June 2023, Apple introduced the world to the era of Spatial Computing (1). Apple Vision Pro (AVP) is a Spatial Computing head mounted device that blends digital content over the physical world to enable new productivity opportunities, entertainment experiences and improved human connections. It is Apple's first Spatial Computer, and its first new product line since Apple Watch in 2015 (2).

The concept of Augmented Reality (AR) has existed for decades, with companies such as Meta having first-mover advantage of commercialising this technology. However, Apple took a different approach for the AVP project, opting for a slower, more quality focused project approach (3). Early concepts and designs began in the mid-2000s, hallmarked by the first patent secured in 2007 (4).

Although AR is an existing product category, due to its novelty to Apple, and the large amount of important technological breakthroughs involved, this project was treated as a first-timer project. Due to uncertainty around cutting-edge technical development and information around the future market size and demand for this type of product, this can be declared a very high-risk project. So, understanding risk mitigation becomes crucial to project success.

This project required extensive resources from Apple, with a separate Vision Products Group (VPG) created to develop the product, costing Apple approximately $20 billion in R&D spending (5), increasing the importance of success.

This project also had high reliance on internal teams from other departments and manufacturing suppliers. To develop a full ecosystem and development platform, AR features, such as Lidar and ARKit, first had to be implemented into iPhone (6). This dependence increased the importance of strategic time management. The project was also affected by key changes to team structure. A US only launch on February 2, 2024 concluded the project.

This report analyses the project management approach and strategies during the development of AVP. The effectiveness of Apple's approach against the project's scope, time and cost were then evaluated. These insights act as learnings for future new consumer technology projects.

2 Project Analysis

2.1 Business Case

At conception, Apple began working on the AVP project as their next big product category for the future, with CEO Tim Cook believing that AR is a "profound technology" (1). This was a high-risk approach, but Apple, known as an industry leader, was aware of the need for constant innovation to remain ahead of competitors.

The development of AVP was also crucial in enhancing Apple's brand and ecosystem. In fact, the AVP introduction video is the second most viewed video on Apple's YouTube channel (7), indicating how a new product can reinforce a brand's image, and leverage its existing 2.2 billion customer base (8).

Over the last few years, the smartphone market has matured, resulting in a reduced growth rate of iPhone sales (Apple's lead revenue generator) (9). This has caused Apple's yearly revenue to plateau (10), which indicates a need to diversify their revenue streams. Thus, the financial importance of a revolutionary new product becomes apparent.

2.2 Stakeholder Analysis

Developing this new, highly complex product requires stakeholder involvement across multiple fields. Figure 1 depicts the key stakeholders of the AVP project, split into internal, external, and tertiary stakeholders. Figure 2 positions these stakeholders on a power-interest matrix and Figure 3 further visualises the Iron Triangle for each stakeholder. Stakeholder analysis per power-interest quadrant is performed below:

High Interest High Power: Apple employees and investors are directly involved in the development of AVP. As a public owned company, Apple's individual and institutional investors have complete ownership and control on the ongoing processes, expressing their strategies and long-term vision. Given Apple's culture, employees particularly value quality and time.

Low Interest High Power: Regulatory bodies and governments exert significant power in the industry, ensuring product safety and regulatory compliance, both before and after product launch. They can demand changes or stop development if the product does not satisfy established health, safety, or privacy standards, such as compliance with FCC regulations, data protection legislation and anti-trust regulations (11).

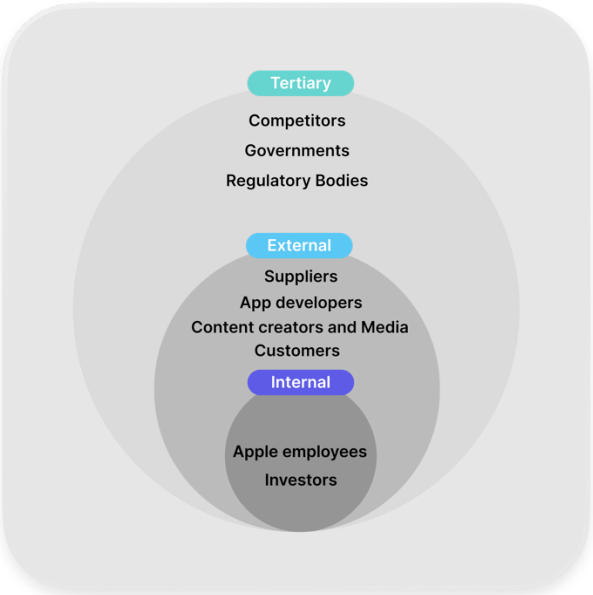


Figure 1: Scope Grouping of AVP Stakeholders

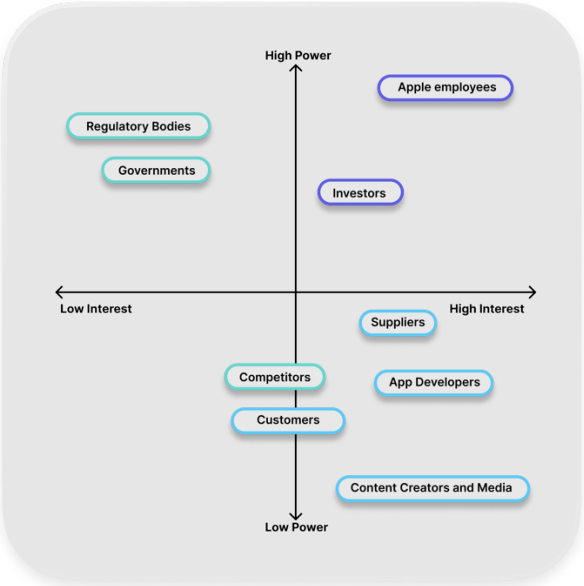


Figure 2: AVP Stakeholder Power-Interest Matrix

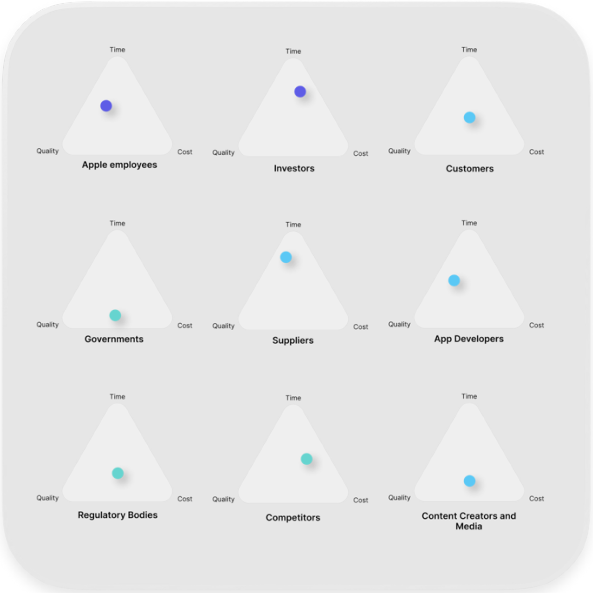


Figure 3: Iron Triangles for AVP Stakeholders

High Interest Low Power: AVP's ecosystem relies on app developers, content creators and suppliers, being key external stakeholders. With a portfolio of 600 apps built particularly for AVP, stakeholders have high interest in designing the best user experience and interactions in line with AVP, demonstrating the shared efforts and desires to expand the platform's potential (12). Apple's strong relationship and extreme dependence on app developers is highlighted by their efforts to make more than 1 million apps compatible with Apple Vision devices at launch. For example, firms like Omni Group updated their OmniPlan 4 project management software for AVP, taking advantage of visionOS. These strategies guaranteed and maximised the software compatibility to enhance the device's value across a variety of sectors. Content from partners, such Jon Favreau's "Encounter Dinosaurs", highlighted the depth of integration desired to enhance the user experience (11)

Low Interest Low Power: Customer interest in the project would eventually determine its success once on the market. So, while they have low power in the project itself, their needs are considered in the product's features. Despite their little direct contribution throughout the development process, these customers are expected to have medium interest in the development of the AVP project. Apple values customer voice, highlighted by the wide variety of apps and games available at launch to meet customer's interests, ensuring a seamless transition onto the new platform (13). Particularly, AVP's customer centeredness demonstrates the extensive considerations taken in its development, prior to its launch. It included considerations of environmental policies and well-being, given the psychological effects of immersive technology on consumers. For example, Apple's use of 100% recycled aluminium in AVP's manufacturing demonstrates a dedication to lowering the environmental impact of its products (13). Also, Apple's Mindfulness app and digital health features acknowledge the significance of user well-being in today's immersive and pervasive digital experiences (11). This customer-centric approach demonstrates a knowledge of the larger consequences of adopting such a disruptive technology. Additionally, with competitors such as Meta having different priorities when developing their own headsets, it is likely that they have little power in the AVP project.

2.3 Time Planning

Whilst international launch is still to be determined, this report focuses on the project timeline from AVP's first registered patent to US product launch between the start of 2007 until February 2nd 2024, see Table 1. Key milestones in this timeline are highlighted in yellow.

The timeline includes the key acquired companies and experts within the AR industry (14,15) to make the development of AVP possible, emphasising Apple's commitment to in-house development and vertical integration. Over the course of the project, over 5000 patents were filed (4). A gap between 2007 and 2015 can be found in the timeline, as Apple strategically avoids sharing development details to media, and it is expected that initial R&D was performed during this time. Officially, AVP's development phase kicked off in 2015 with the Technology Development Group (TDG) lead by Rockwell (3). Apple's knowledge in developing iPhone, custom SoCs, ARKit, and Spatial Audio laid the groundwork for the technology within AVP, highlighting the relevance of strong corporate resources in AVP's development timeline. Internal conflict and reorganisation, such as Jony Ive's initial opposition against an AR demo in 2016 could be argued to slow down the project timeline, but highlights Apple's commitment to prioritising quality over cost and time.

Table 1: Timeline of the AVP Project (4,7,14-20)

Date	Timeline Milestones
2007	Received first patent related to AVP: Head mounted display
05.2015	Acquired Metaio, a German AR company
2015	Hired Mike Rockwell from Dolby Laboratories, who leads the Technology Development Group (TDG)
2016	TDG developed AR demo, opposed by CDO Jony Ive
04.2017	Hired AR and VR expert Jeff Norris from NASA
2017	TDG delivered Apple's ARKit with iOS 11
11.2017	Acquired Canadian MR company Vrvana
2019	CDO Jony Ive leaves, replaced by Evans Hankey
05.2022	Apple executives previewed prototype of device
06.2022	Recruited directors to create marketing content
04.2024	Attracted developers to make software and services
05.06.2023	Announced at Apple's Worldwide Developers Conference
06.06.2023	Acquired Mira, an AR headset start-up
19.01.2024	Pre-orders begin and mass shipments begin
02.02.2024	U.S. Launch
TBD	International launch

2.4 Risk Management

Successful technological developments take many years, from the initial design process to launch, with short completion often correlating with rushed decisions and poor outcomes (21). Examples include Apple's iPad, which took 9 years to develop (22), compared with the unsuccessful Google Glass, which reportedly only spent a few days in market development (23). Consequently, the 17-year AVP development highlighted in Table 1, is unsurprisingly long given the technological, management, and other risks that were mitigated (20). The extended timeline reduced the risks and potential impacts of setbacks, but only Apple's mitigation strategies could fully eliminate them. Figure 4 is a PESTEL analysis used to identify external market factors to create a SWOT analysis to consider both internal and external factors in Figure 5. These frameworks highlight the factors contributing to the risks AVP faced during its development timeline, see enlarged versions in Appendix B.

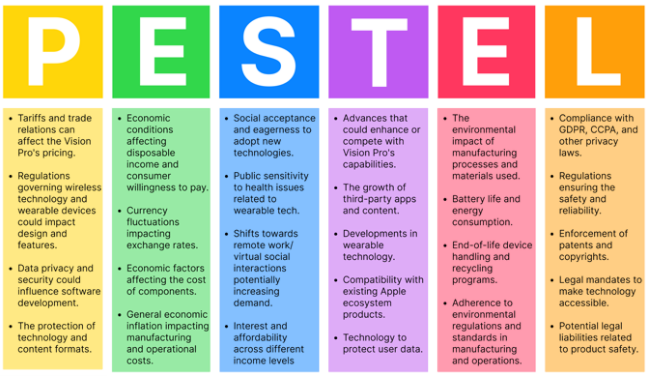


Figure 4: AVP PESTEL Analysis

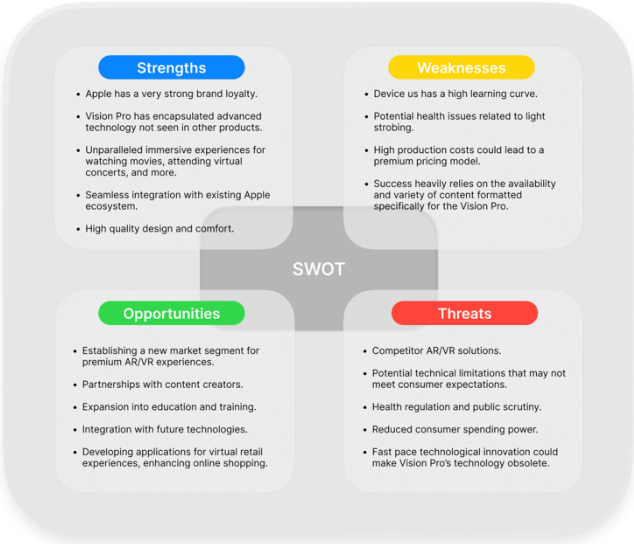


Figure 5: AVP SWOT Analysis

2.4.1 Scope Risks

The project scope developed significantly from 2007 to its launch in 2024. This was caused by strategic acquisitions, extensive hires and personnel changes, like buying Vrvana and Mira (19), and hiring experts like

Jeff Norris from NASA (18), see Section 2.3. These decisions not only enhanced the project's technical capabilities but also shaped its direction towards creating a comprehensive AR experience within the Apple ecosystem (24). However, this complex shifting to establish a new project environment also came at the risk of delaying product launch and experiencing project scope creep.

2.4.2 Scheduling and Resource Risks

Table 2: Speculated Failure Mode and Effects Analysis Table Detailing the Scheduling and Resource Risks Encountered by the AVP Production Team

Process Step / Function	Potential Failure Mode	Potential Effects of Failure	Severity	Causes of Failure	Occurrence	Current Controls	Detection	RPN (Risk Priority Number)
Manufacturing of 256GB and 1TB models	Delay in manufacturing	Delayed product availability	8	Technical challenges in production	4	Quality checks and technical oversight	3	96
Supply Chain & Inventory Management	Inadequate inventory for launch	Limited product availability on launch day	7	Misalignment between production and sales forecasts	3	Inventory tracking systems	4	84
Pre-order Fulfilment Process	Inability to meet pre-order shipment dates	Frustrated customers due to unexpected wait times	9	Logistical bottlenecks	5	Order tracking and management systems	3	135
Customer Communication Strategy	Ineffective communication of delays	Eroded trust and negative customer sentiment	6	Lack of a proactive communication plan	2	Customer service protocols	5	60

The scheduling and resource management for AVP's launch, documented in Table 2, was significantly challenged, marked by delays in shipping dates that caused widespread customer dissatisfaction (25). Initially pre-order shipments were due for delivery on February 2nd 2024 (26), but shortages extended delivery times to between February 29th and March 7th for most orders (27), with some reports suggesting further delays until March 14th (28). This inconsistency highlights the difficulties in coordinating supply chain logistics and meeting fulfilment demands for a product as highly anticipated as AVP. This lack of risk foresight was misaligned with Apple's historically strong performances, which detail great success in meeting high demands (28), suggesting external influences were causing the delays.

Specifically, the 256GB and 1TB models experienced these delays (29), pointing to potential manufacturing constraints or inventory management issues with these versions. While the root cause of these setbacks is not definitively known, one speculation is Apple's strategic focus on increasing in-store stock to cater to launch day demand while risking an ability to fulfil online pre-orders (30). This approach inadvertently affected those who pre-ordered, illustrating a risk management imbalance in Apple's ability to satisfy direct sales while honouring pre-order obligations.

Another significant technical and resource risk emerged from the heavy reliance on components supplied by Japanese companies, accounting for 42% of parts, including crucial high-definition displays from Sony (31). This dependence not only exposed the project to vulnerabilities related to supply chain disruptions but also increased the risk of cost overruns due to the specialised nature of these components. Due to these dependencies and the consequential pipeline bottlenecks concerning the manufacture of certain complex components, Apple had to cut its year-one production goals by more than 50% to only 400000 units (32).

2.4.3 Commercial Risks

Commercial risks to AVP included the highly competitive nature of the consumer tech industry, which is subject to rapid technological changes. Apple had to navigate this carefully to ensure AVP remained competitive against rivals such as Metas Quest 3 and Quest Pro, Sony PlayStation VR2, and XREAL Air 2 AR Glasses (33).

Additionally, variability between country standards, cultures, and regulations posed risks to Apple. Navigating these complexities presented a significant challenge, as varying standards across countries affected AVP's distribution and compliance (34). Cross-cultural misunderstandings posed another risk, impacting marketing strategies and consumer acceptance in various markets (35). Finally, currency volatility also threatened to disrupt pricing and profitability, particularly given AVP's reliance on a global supply chain with substantial contributions from Japanese suppliers and Chinese manufacturers (36).

2.5 Project Organisation

Since Steve Jobs re-joined Apple in the 1990s (37), the company structure has been strictly split into departmental divisions rather than product-based divisions, see Figure 6. This helped propel Apple's innovation and ultimately saved them from bankruptcy in 1997 (38). However, the AVP project ended up disrupting this structure as Apple chose to create the TDG in 2015, specifically for AVP's development process. This is now internally known as the VPG (17). This change in project organization stemmed from the AVP project's higher complexity compared to more traditional projects running at the same time, such as iPhone and Macintosh products.

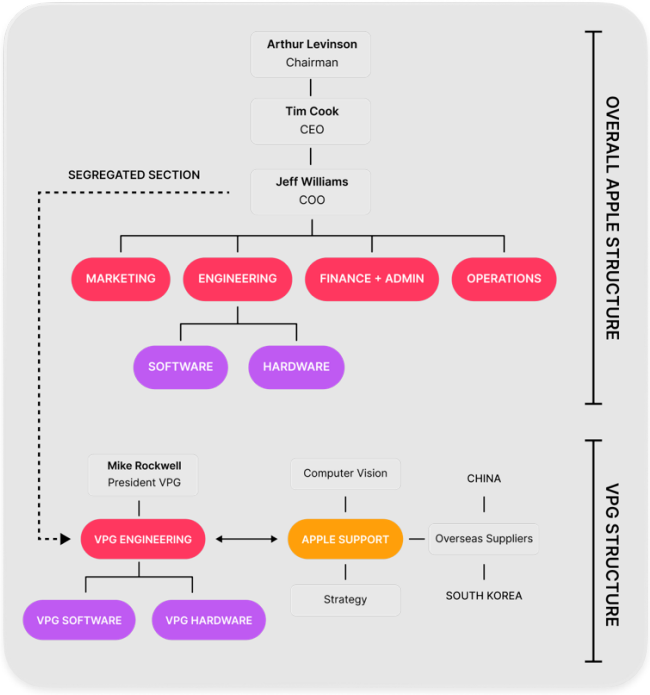


Figure 6: Organizational Structure of Apple and the VPG

The key difference between AVP's organisational structure and that of other Apple projects, is that it was developed under the VPG's smaller and somewhat independent managerial structure. The project structure included the VPG's own independent hardware and software engineering divisions alongside other external departments such as computer vision, strategy, and app development reporting back to the senior members of the VPG, ran by Mike Rockwell (39).

As seen from the structure in Figure 6, the segregated VPG engineering teams could fully concentrate on the innovation surrounding the AVP. Whilst, when needed, they could receive support from other disciplines within Apple. For example, Apple supported the project through linking the VPG group with part suppliers Luxshare and Samsung from China and South Korea respectively (40).

Figure 7 shows an overview of the physical breakdown structure for the AVP project. This was essential during the project planning stage to help define the work-packages ready for deriving the critical path analysis and Gantt charts for the VPG to follow.

3 Project Evaluation

3.1 Outcomes Assessment

Now that AVP has been launched and is available in the US to the public, assessing the outcome of this project through different aspects is extremely important. This evaluation should examine how well the project met its specific objectives, particularly in terms of cost, quality, and time, and how well its stakeholders and risk were managed.

High R&D expenditure resulted in high costs, given the substantial innovation required. Apple's products, like AVP, stand out because of their expected quality, which improves user experience and strengthens brand loyalty. Lastly, time is set as a constraint in the AVP project, given the quickly changing market demands in the consumer electronics industry.

The evaluation of the AVP project is crucial for future technological innovations, placing this project as a standard in the evolution of consumer technology and Spatial Computing. By using the Iron Triangle and Project Priority Matrix in Figure 8, the priority of time, cost and quality can be assessed and will be analysed in depth in the following sections.

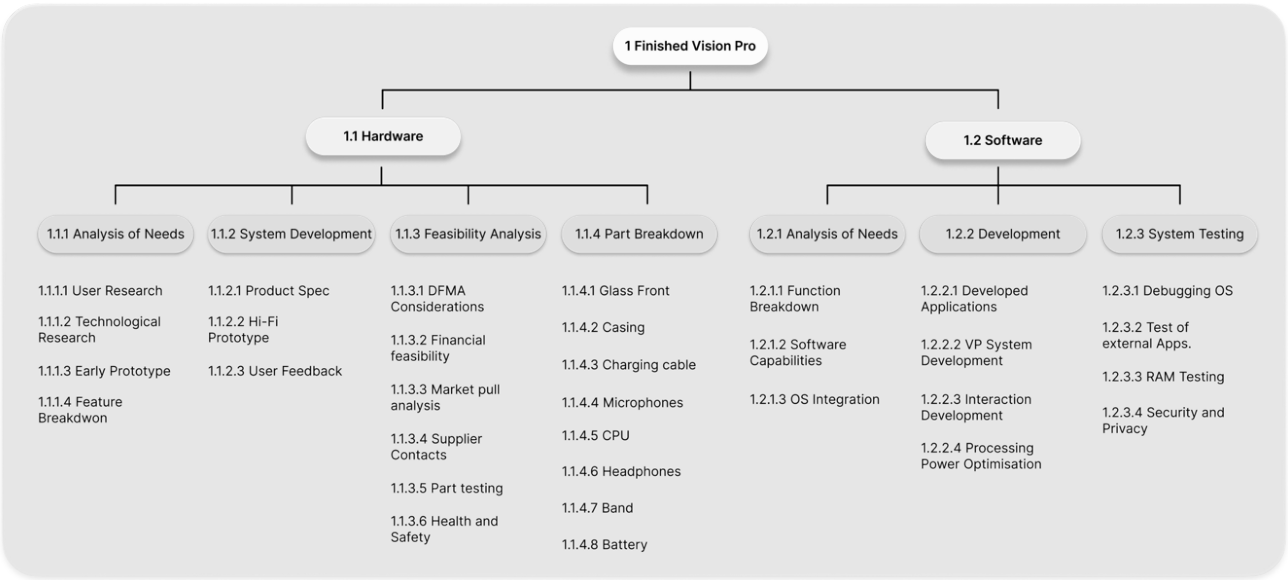


Figure 7: Simplified Work Breakdown Structure for AVP

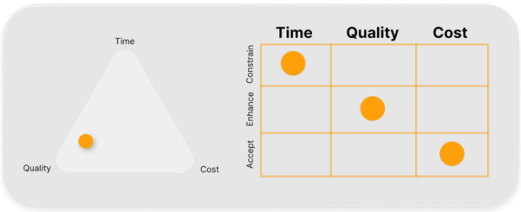


Figure 8: Project Iron Triangle (left) and Project Priority Matrix (right)

3.1.1 Cost

As can be seen from Figure 8, cost is not Apple's main priority, and it was placed in the accept category. Given their premium pricing strategy, consumers expect Apple products to be of high quality and design (41). It is estimated that out of the $100 billion Apple spent over the last 5 years, around $20 billion was allocated to AVP (5). In fact, Apple's R&D intensity has been at an all-time high since the 2000s before the iPhone launch. Since 2020, Apple spent an additional $10 billion on R&D, given their AVP project accounted for significant capital (42). Overall, the cost of the AVP project is deemed reasonable, as Apple's CFO reflects that this additional R&D spending "pays for itself" (42), suggesting that Apple has modelled the project's ROI appropriately to account for this high project cost.

3.1.2 Quality

The project's main focus was quality, which was essential in shifting existing social perceptions about AR and demonstrating a future vision. This was successfully considered during product development and launch.

Unlike other products, Apple decided to constrain the initial launch to US only. This was a deliberate effort to ensure smooth roll out, part of their quality control, and refine issues prior to global launch, mitigating risk of customer relationship issues (e.g. store layout changes, set-up experience, buying process) all of which were part of an entirely new process for Apple. This decision was largely successful, as the new sales process generated hype (43) and led to significant demand compared to volume produced (44). AVP had a return rate of less than 1% (45), which is lower than the industry standard, which indicates that the product's controlled, quality focused approach paid off.

Apple successfully met the high expectations of customers who expected a very high-quality experience given its high retail price. Initial reviews stated that the experience was unlike any existing device on the market, with particular praise for features such as the displays, hand and eye tracking, passthrough and software integration (46). Interestingly, these were also the features that Apple spent the most R&D money and time on, developing breakthrough software, chips and processes (47). So, by focusing their attention on parts of the product that competitors lacked, Apple was able to capture customers' interest. However, there was some concern about the weight, formfactor and the lack of app support (48). These factors will largely determine long term adoption and success of AVP. It can be assumed that this would be an area of focus for a future project, outside current project scope.

3.1.3 Time

The most important aspect to Apple's project timeline was launching the product at the right time into the market to ensure customer readiness and acceptance for this cutting-edge and disruptive technology (26). This meant that their time was constrained in terms of meeting the required technology readiness level to be able to launch appropriately. The dependency of needing to acquire external firms and experts to be able to perfect the product in-house, increased the difficulty of time management in the initial phase of the project.

While Apple spent 17 years to develop AVP, this is reasonable given that Apple's attention to detail and quality is where they excel to a gain competitive advantage. Specifically, one of the main causes of a long development timeline was the fact that 50% of the technology in AVP had to be invented by Apple (3). Competitors, such as Meta Quest, released their VR/AR headsets before Apple in 2019 (49). Instead of its success coming from being a first mover in this technology, Apple's success of AVP stems from the combination finding the right time for the customer to launch the product, in tandem with strategic resource optimisation, and a commitment to always exceeding customer expectations with cutting-edge technology.

3.2 Stakeholder Management

To achieve an effective and successful rollout upon the development of AVP, the company established, as per all its creations, clear roles and responsibilities within the project team. Apple, leveraging its extensive experience across all its project evolutions, in product development and market launches, ensured alignment with the project's objectives from the start throughout its chain of work. Apple's approach exemplifies the importance of strong leadership and a qualified workforce to supervise cutting-edge technology projects as well as diversification of tasks and teamwork.

Ownership, collaboration, and communication, within such a big company, played a significant role in AVP's development. Through strategic acquisitions and partnerships, Apple ensured the consolidation of essential AR technologies under its brand, which streamlined the project ownership and eliminated any potential delays related to partnership disputes or misalignments.

Recognising the value of external stakeholder engagement, Apple actively collaborated with developers and content providers to improve the AVP ecosystem. This strategy prioritised external stakeholder interests, such as environmental sustainability and user well-being, whilst minimising negative impacts and increasing product acceptance and market success.

This stakeholder management approach helped Apple understand the development from an all-rounded perspective, merging technical innovation with strategic planning, collaboration, and sustainability initiatives. Apple's ability to manage and coordinate the interests of all its stakeholders, internal and external, is exemplary of how large-scale, high-technology projects may be executed.

3.3 Risk Assessment

The AVP project's extensive 17-year journey highlights a combination of strategic foresight and risk management challenges, particularly in scope, scheduling, resources, and commercial areas. While the project's ambitious scope, driven by key acquisitions and hires, improved and expanded its technical scope, it also introduced risks related to scope creep and delayed market entry. Scheduling and resource management issues were present in the pre-order shipments, suggesting deficiencies in supply chain coordination and risk foresight. Finally, intense competition, rapid technological shifts, and reliance on a concentrated supplier base all increased commercial risks.

When evaluating the risks faced by the AVP project, it becomes evident that even though Apple's mitigation strategies addressed many challenges, opportunities for improvement remain. Enhanced forecasting methods, more agile supply chain management, and deeper market analysis could have further minimised the impacts of these risks. Additionally, a more dynamic approach to risk assessment, including regular reviews and adjustments, could be a valuable strategy in future projects, ensuring adaptability in the face of unforeseen challenges and unintended consequences.

4 Lessons Learnt

This section discusses four key lessons learnt by Apple during the development of the AVP project. It also discusses potential project management frameworks and techniques that would have been beneficial.

4.1 Adaptable Organisational Structure

Due to AVP's complex and 'never-seen-before' nature making it a first-timer project, Apple had to change their traditional organisational structure and create VPG's specific project structure (17). Overall, this change helped speed up the project's timeline preventing it from falling too far behind its schedule for release and out of its initial desired price range (50).

In hindsight, the move from a waterfall approach to a more agile project management methodology could have happened sooner at Apple, as it would have allowed for more feedback loops in the development process, depicted in Figure 9.

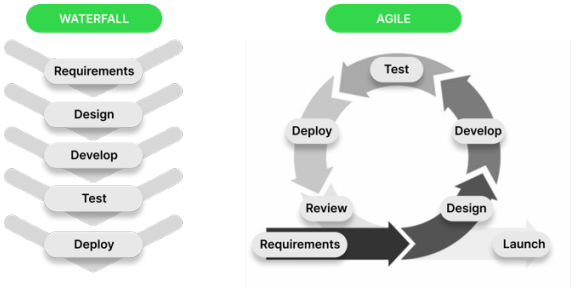


Figure 9: Waterfall vs Agile Project Approach

For example, in terms of the backlog in the release date, Luxshare, the current only manufacturer of AVP, had only agreed to produce 400000 units of the product in 2024. This presented Apple with an un-identified problem that could have been solved by incorporating more 'manufacturer-engineer' feedback loops during the process. Furthermore, in terms of pricing, the development of the micro-OLED display in partnership with SONY came out to be more expensive than initially expected at $456 USD (for the 2 displays needed in the product) (51). Therefore, through adopting a more Agile and feedback-driven project approach, DFMA (Design for Manufacturing and Assembly) adjustments could have been made to make the AVP more affordable and mass-producible.

4.2 Ensuring Global Compliance

Launching a product as sophisticated and category-defining as AVP requires compliance with various international regulations and standards, which can vary significantly from country to country. This variance in health and safety, wireless communication, and data

and privacy regulations (52) across different continents and countries has led to AVP only being launched in the US for the meantime. Thus, this reduces the number of customers and revenue from initial launch.

In hindsight, Apple could have incorporated a more global project development framework such as IPMA's ICB (International Competence Baseline) framework (53). This framework considers contextual competences and regulatory compliance, by adhering to the framework's principles, large organisations are better prepared for launching their products on a full global scale. Many organisations, such as Apple, who centralise their innovation divisions in centres like Apple Park in Cupertino, can be prone to complications with immediate globalisation of their products. Apple has been successful so far with global compliance for its other products, but given AVP is a highly disruptive technology, future regulation for the widespread adoption of Spatial Computing is expected and will affect future Apple Vision projects.

4.3 Strengthening Supply Chain Responsibility

The management of a worldwide supply chain for high-tech products involves several complexities, highlighted by the AVP project. A major issue that Apple had in the manufacturing phase was finding a reliable and moral source of essential parts in the face of worldwide shortages and logistical delays. The epidemic, geopolitical unrest, and rising demand for semiconductor chips and other electronic components worsened these disruptions (54). Also, Apple had to increase production by 200k units after its launch, putting more pressure on supply chain management (55).

The supply chain was especially susceptible to delays and problems with quality control since it was dependent on a large network of suppliers located in several nations. To source specialised components, such as the sophisticated micro-OLED displays, collaborations with suppliers capable of upholding Apple's exacting ethical and quality requirements were necessary. This demonstrates the need for more robust supply chain tactics, like expanding supplier networks, spending money on supply chain visibility tools, and improving supplier relations.

In hindsight, Apple could have adopted supply chain frameworks that prioritise alignment, agility, and adaptation, such as the Supply Chain Operations Reference Model (SCOR) (56). By implementing such frameworks, Apple can better predict interruptions, adapt to changes, and preserve the integrity of their supply chain operations, which supports the production and delivery of products without sacrificing standards for timeliness and ethics.

4.4 Improving Risk Mitigation Against Scope Creep

The process of developing AVP shed light an important issue: successfully controlling the project's scope to avoid scope creep, a frequent hazard that can cause projects to fail by extending their goals beyond the initial parameters. Due to the complex and new technological nature of AVP and the high expectations of the market, there was a greater chance of incremental scope increase that may have resulted in delays, overspending, and resource strain.

Upon reflection, the use of scope management techniques, to guarantee that all additions and modifications are considered, could have strengthened Apple's project management approach. By incorporating Agile approaches and risk mitigation techniques, Apple could maintain adaptability to changing requirements and input. For example, risk mitigation techniques, to monitor and predict the likelihood of risks, and simulate contingency plans as well as looking at process standards, could have supported Apple's decisions in which actions to take to tackle potential unintended consequences. Figure 10 shows different approaches Apple could have taken to improve risk mitigation against scope creep.



Figure 10: Risk Mitigation Techniques

5 Conclusion

Apple Vision Pro represents a step into the future of Spatial Computing. By focusing their attention on parts of the product that competitors lacked, Apple successfully captured customers' interest. Its project management approach, driven by Apple's commitment to innovation, quality, and market leadership, demonstrates their success in commercialising revolutionary technologies. Importantly, the AVP project offers indispensable lessons for the management of future disruptive projects. The lessons learnt, including the need for adaptable organisational structures, ensuring global compliance, strengthening supply chain responsibility, and improving risk mitigation against scope creep are critical to navigate the uncertainties of cutting-edge product development.

Therefore, the AVP project highlights the balance of innovation, quality, and market readiness required to successfully launch disruptive technologies. Despite the complexities encountered, AVP has gained critical acclaim and initial customer acceptance, establishing a benchmark for future Spatial Computing experiences. Apple's approach by prioritising customer experience and technological excellence, positions AVP to transform the world of Spatial Computing. Insights from this project will shape the management of Apple's future innovations, ensuring that technology serves its users in revolutionary ways.

6 Appendix A – Compulsory Appendix

6.1 Project Organisation

The project was organized using a Work Breakdown Structure (WBS) into four key phases: Planning, Analysis, Evaluation and Finish. As part of the "1.2 Project Start Team Meeting", the team created an activity-based WBS, to split the project into more actionable activities, see Figure 11.



Figure 11: Activity-based Work Breakdown Structure

Upon critical path analysis (CPA) in Figure 12, key interdependencies, particularly between Phase 2 and 3 activities were identified. The "finish to start" dependency type frequently occurred, delaying the earliest start time of certain sub-activities. Note, the project includes relatively high float times, as external dependencies of other module's coursework had to be accounted for, for example when team members had similar due dates for other modules. The team decided to take inspiration from Netflix's "Freedom and Responsibility" culture, where each team member was held accountable to complete tasks, given these float times.

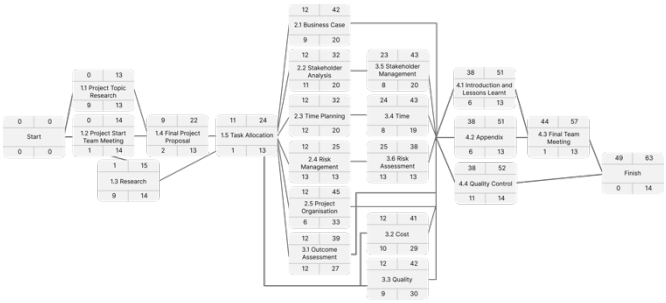


Figure 12: Critical Path Analysis

This WBS and CPA were then used to form a project Gantt Chart in Figure 13, which entails the four WBS phases, its sub-activities, durations, resource allocation and milestones shown by yellow diamonds. The internal milestones helped ensure on-time project completion and foster collaborative effort. Resource allocation in the Gantt Chart is shown under the "Assigned to" column. As seen, each sub-activity within a WBS phase was assigned to one responsible team member, and another team member was assigned to review the work alongside its completion. This way, the various interdependent activities in CPA could be most optimally completed simultaneously, with responsible team members executing the next dependent task too.

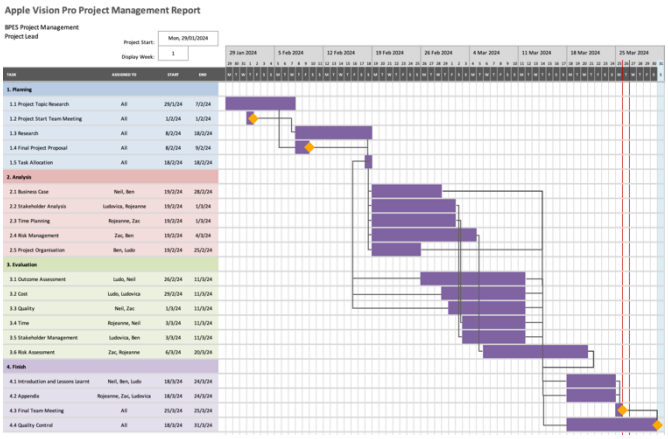


Figure 13: Gantt Chart Indicating Internal Milestones and Resource Allocation

Transparency in communication was promoted through a WhatsApp group chat used throughout the project, ensuring that project quality was enhanced by creating an iterative feedback loop culture within the team. While the Gantt chart accounted for float times to mitigate Murphy's law, the team also faced the effect of Parkinson's law, where tasks were expanded to fill the time available. Therefore, whilst optimising quality of work, the project could have benefitted from indicating external deadlines available, as these sometimes differed for each team member, instead of adding large buffer times to each sub-activity. Please see enlarged versions of Figure 12 and Figure 13 in Appendix B.

6.2 Individual Lessons Learnt per Student

Rojeanne Stoffer

This project built my project management skillset, from both a theoretical understanding and practical implementation. The project management frameworks such as critical path analysis, time evaluation and risk mitigation, are all adding value in any upcoming project. Every project requires balancing time, quality, and cost, and I now better understand that compromises between these are necessary depending on stakeholder values and resource allocation. This course equipped me to make these informed trade-offs while keeping stakeholders engaged, a skill beneficial for my future career, to optimise the quality of outcomes.

Ludovica Marzocco

This project has helped me use the project management skills that were mentioned in the lectures. I now understand the paramount importance of prioritising certain factors, such as time, quality, and cost, and how using diagrams such as the Iron Triangle and the Project Priority Matrix can help better visualise the structure of a project. Working on the lessons learnt from this project, I was able to understand how the use of different frameworks such as the IPMA framework or the Supply Chain Reference Model, as well as the implementation of Risk Mitigation techniques to assess the impact of a risk and find the best way to address it, can help shape a project and tackle features that could potentially be a problem throughout the development of the project.

Benjamin Lovell

Conducting this project helped me see how companies have used the frameworks learnt in the lectures have been applied to real-world projects. Specifically, when looking at the varying Work Breakdown Structures that are applied throughout the development of a project then how they are turned into project plans and milestones. Furthermore, looking at how Apple allocated resources throughout the project timeline for the AVP is linked to the PERT framework alongside the Critical Path Analysis. I'm hoping to take these skills with me as I progress into more managerial roles within companies after I graduate.

Neil Patel

By analysing the approach to Project Management of a large technology company, I have been able to develop my understanding of how companies take calculated risks by ranking their likelihood and severity, especially important for a project that when started, was aimed at a future market. By evaluating the project through 3 lenses: quality, time and cost, I was able to understand how prioritisation plays an important role in project success. With my ambition to work in Project Management roles at technology companies, this module was a useful insight into theoretical frameworks that I can use to effectively manage and deliver projects – managing stakeholders and defining work breakdown structures will be particularly important to my role.

Zac Baylis

This project has greatly improved my understanding of project management, particularly in structuring tasks and managing risks. Learning to deconstruct projects into manageable work packages and applying tools such as a Critical Path Analysis and Gantt Charts has strengthened my scheduling skills, making me more adept at ensuring projects progress efficiently. Examining the AVP highlighted the practical value of these methodologies in real-world scenarios, reinforcing the importance of strategic risk mitigation. This experience has solidified my interest in project management, equipping me with essential skills for my future pursuits in a project management role after university.

Ludovica Franchi

This project enhanced my capabilities by integrating theoretical knowledge with practical applications, especially in stakeholder analysis and resource allocation. I gained insights into the importance of balancing key project parameters—time, quality, and cost—guided by tools like the Iron Triangle and the Project Priority Matrix. This highlighted the role of effective communication and strategic compromises in aligning with stakeholder values. My enhanced understanding, prioritising of project elements and a more in-depth stakeholder analysis, made me appreciate the role of PM. This enriched perspective, fortified by the practical example, is an asset I look forward to applying in future managerial roles, with the ambition of being part of successful projects.

Appendix B – Supplementary Appendix

7.1 Enlarged PESTEL and SWOT Diagrams

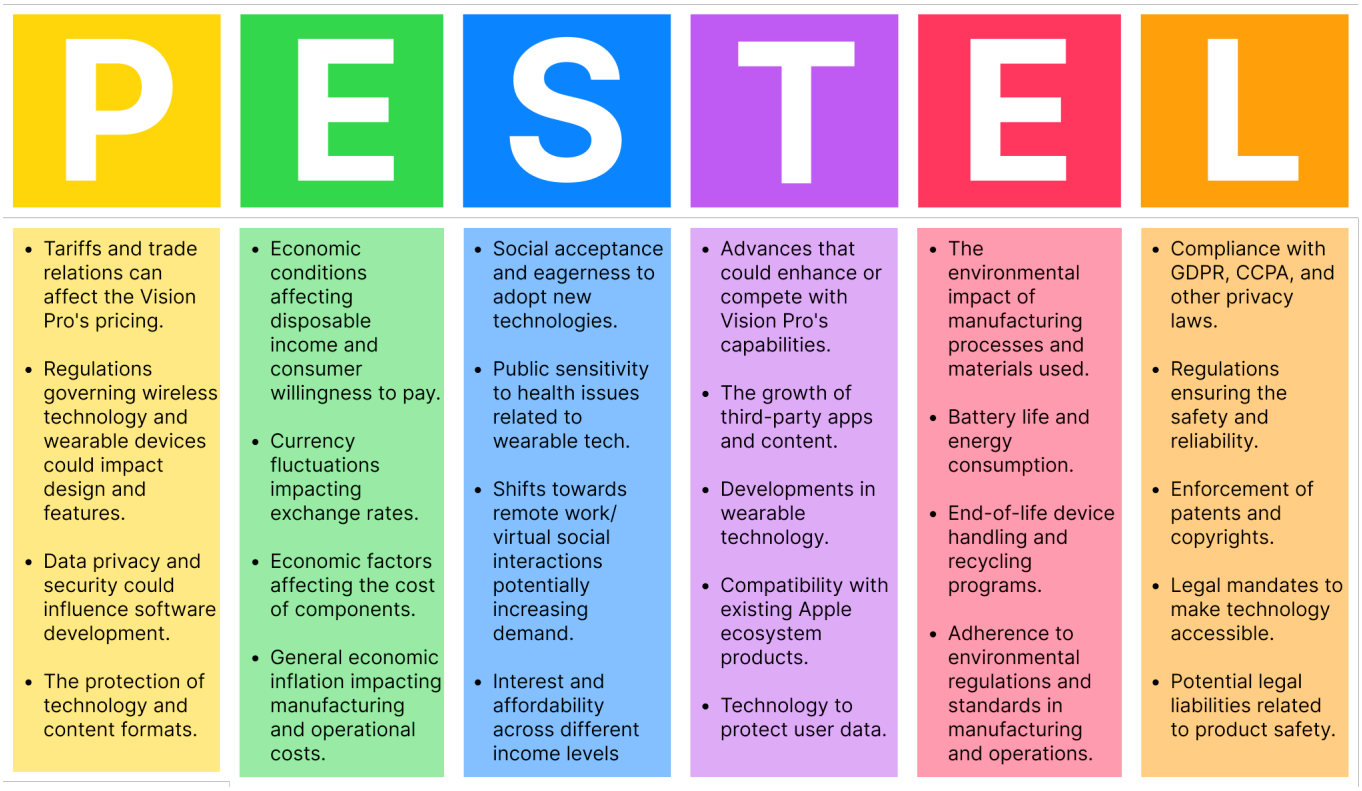


Figure 14: Enlarged PESTEL Analysis

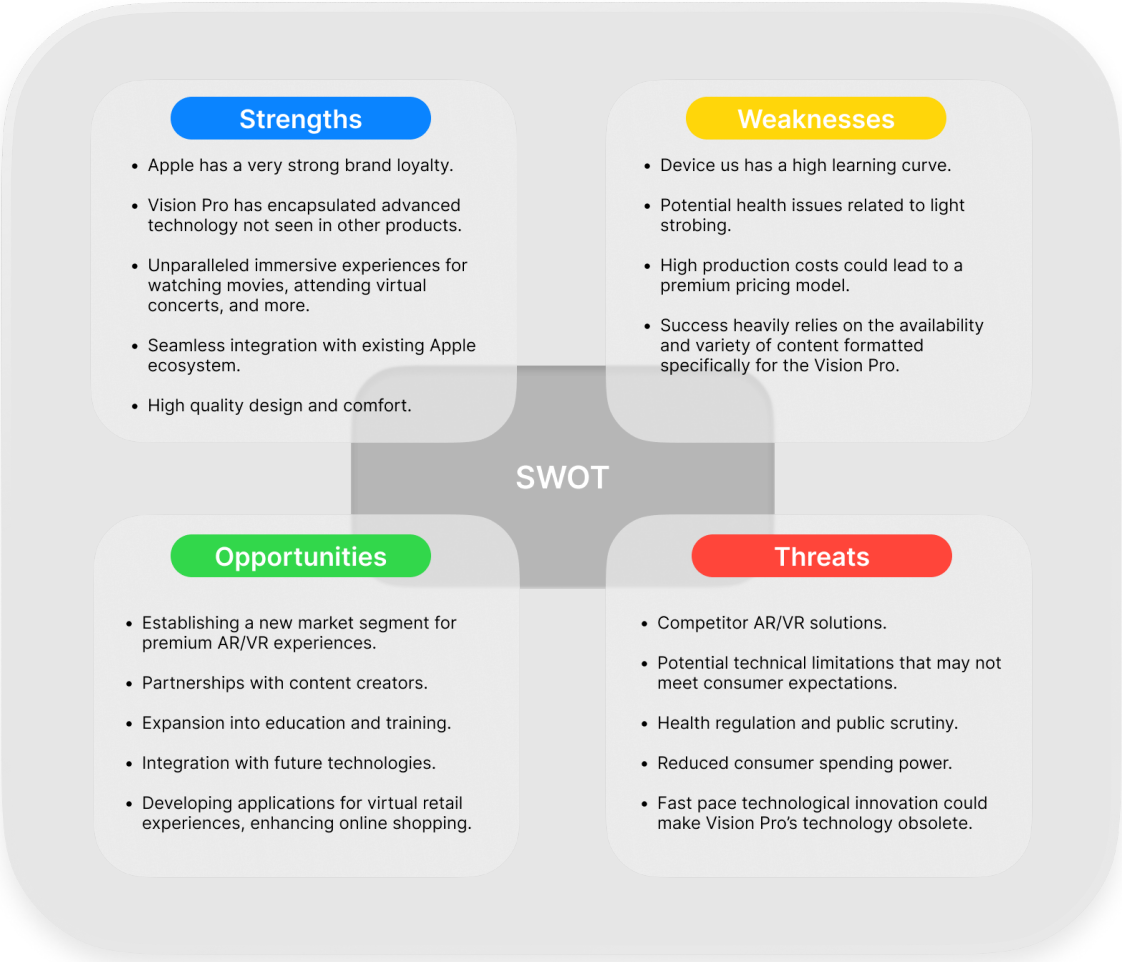


Figure 15: Enlarged SWOT Analysis

7.2 Enlarged Critical Path Analysis and Project Gantt Chart

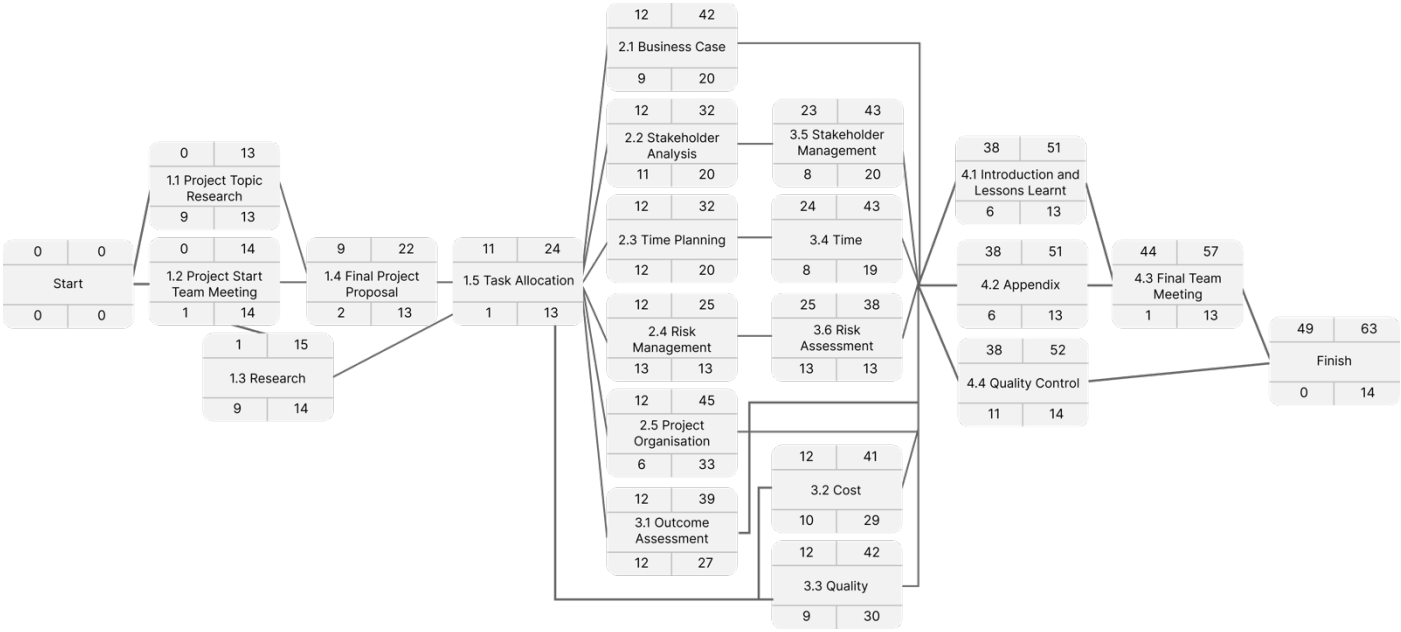


Figure 16: Enlarged CPA for Project Management Report

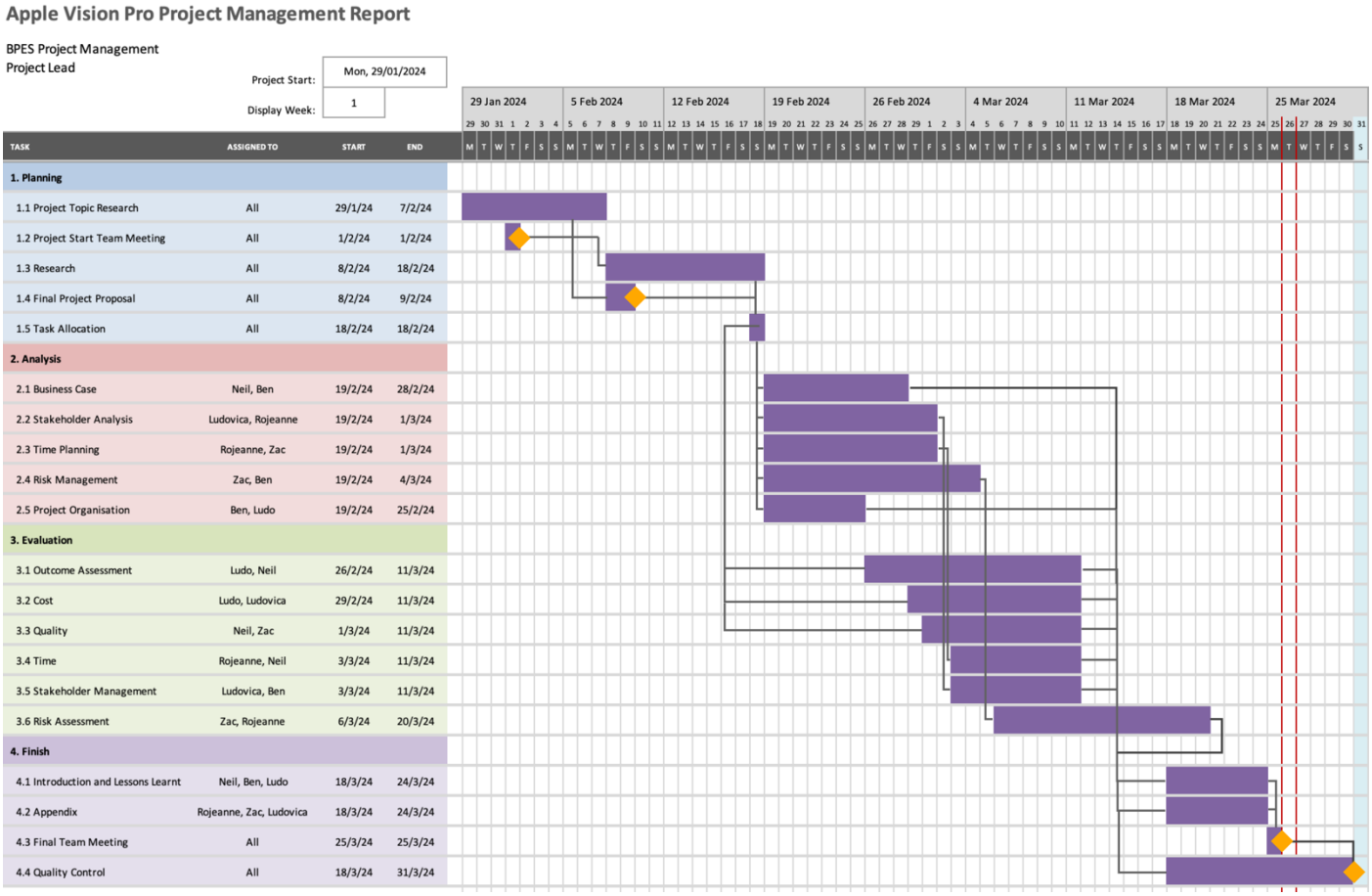


Figure 17: Enlarged Gantt Chart for Project Management Report

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