

**An Evaluation of an innovative product called
'AirPods' developed from the company Apple**

By

Ryan Thomas

Student Identification Number: 1202938

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Contents

1. Introduction	3
2. Principal Drivers for the Innovation	4
3. Barriers and Risks faced in developing the Innovation	5
4. Key Determinants in the process of committing to develop the Innovation	6
5. The Processes and Technologies which the company used to carry this development forward	7
6. The extent to which the development relied on resources external to the company and the ways in which the deployment of these resources was managed	9
7. How management overview of the development was maintained	10
8. The extent to which the innovation process represents best practice	11
9. An evaluation of the success of the chosen innovation	13
10. References	14

Introduction

In this assignment, the main objective is to evaluate an innovation from a chosen company, which may be a product, process, business model or marketing innovation.

The chosen innovation is a product developed from the company Apple called **AirPods**.

Apple is a globally renowned company founded in 1976 by Steve Jobs and Steve Wozniak, who started developing computers for home and office that were easy to use. (Library of Congress, 2022). They have since developed a number of innovative products, including the iPod (music player), iPhone (the first modern smart phone), Apple Watch and the most recent innovation, **AirPods**. (Make Use Of, 2022)

Apple's **AirPods** are wireless earphones that connect to the iPhone, which allows the user to listen to music, podcast, or to speak to another person via a phone call more efficiently and conveniently.



(The Guardian, 2022, NBC News, 2022)

The product was first introduced to the market in 2016 and has since been a huge success for Apple with various generations of the product released for improved performance.

The following report analyses the company and the product in every aspect of the innovation process so see how the innovative product has become a success.

Principal Drivers for the Innovation

For years, the 3.5mm headphone jack (an industry standard audio plug) was the most common method that people used to connect their headphones to their devices to listen to music. People had to live with tangled headphones, plugging / unplugging the cable jack, having the cable caught whilst moving about that sometimes lead to cable damage.



(Future of Technology, 2023, Broken Headphone Wires, 2022)

Apple recognised this issue, and at the same time, saw that there was an emerging opportunity for a new innovative product to the market that will work in-line with the iPhone, another product already developed by Apple that has been a huge success.

When the new iPhone7 was launched in 2016 it came with a big surprise to everyone, it was released without a 3.5mm headphone jack. (History of AirPods, 2021). Instead, wired headphones (EarPods) were included with the smartphone with the new lightning cable. The lightning cable was developed by Apple and first introduced in 2012 for iPhone 5, as an advancement to digital power and cable durability. (Apple Lightning Connector, 2023).

Now the new EarPods with lightning connection had proven to be a great audio connector, provides digital audio stream, power to headphone and speaker and capture contents and music control. For people who still had old headphones with 3.5mm jack, Apple also provided a lightning to 3.5mm adaptor to allow connection to iPhone. (Apple September Event, 2016)



Wireless the Driver

Removing the 3.5 mm headphone jack and introducing the new Earpods was not the only change Apple had during the launch of iPhone 7. It was the introduction of first wireless headphones: AirPods. For many ears, tech companies new the challenges for going wireless, but it was Apple who had the courage to go ahead and develop something new to the market. With the development of apples first wireless chip (W1) the AirPods were born and were introduced as an accessory for iPhone 7 as an alternative to wired headphones.

Not only did the new AirPods solve some of the existing issues with wired headphones, but Apple created a new technological device driven by the courage to go wireless.

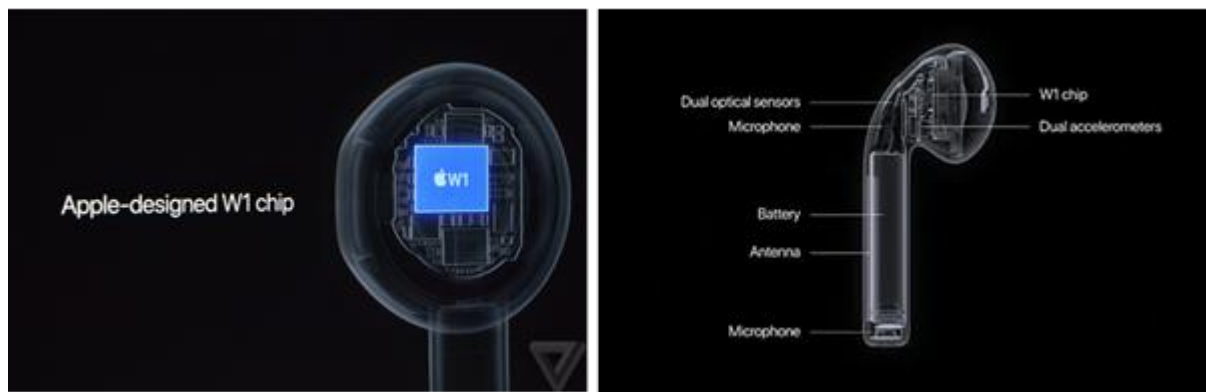
Barriers and Risks faced by the company in developing this Innovation.

The main challenge for Apple was to create a wireless headphone, which gives the same sound quality as wired headphones, a challenge that most tech companies have faced for many ears. This in itself opened up a number of technical barriers to overcome listed below;

- Apple used Bluetooth technology, which is radio frequency. The quality of radio waves can be interfered by human skull, bones, water collecting when people sweat. Other companies used Alpha Audiotronics and Nuheara technology to overcome this issue.
- Connectivity between left and right AirPods - getting audio signal to sync properly between the two. The iPhone transmits the audio signal via Bluetooth technology, therefore each ear bud needs to receive the signal at the exact same time.
- The challenge of having good battery life in such a confined space inside AirPods concept, which already includes other components such as Bluetooth chips, microphone.

(Delay in release of Airods, 2023)

Combining all of the above technical challenges to fit comfortable and securely into your ear is a huge challenge, and Apple took on the challenge by developing their first wireless (W1) chip. Apple have already been successful in the software industry by developing Mac, iPhone, iPad, therefore they have used their existing knowledge and skills to create new technological device. A wireless device that can be easily synced with the existing Mac, iPhone, iPad products.



(Apple September Event, 2016)

After overcoming the technical barriers, Apple identified that there was a risk with the relationship they have with their customer. When the iPhone7 was launched in 2016 without a headphone jack, the AirPods were launched at the same time as an accessory that were not included with the smartphone. The AirPods were separate and came with an additional cost to the customer. To overcome the risk of distressing the customer with an additional cost, Apple cleverly created an adaptor for connecting the old 3.5mm jack headphones to the new iPhone7, which was included with the smartphone. By doing this, customers were not forced to buy the new AirPods product and their experience for listening to audio from iPhone remained the same.

Key Determinants in the process of committing to develop the Innovation

One of the key elements in the design of AirPods was to come up with a shape that was comfortable and secure to all the kind of people. Apple have the expertise in software design and coming up with an electronic device that works, but gathering data to get the optimise shape design was not something they specialised in. Therefore, Apple relied on Stanford university to 3D scan a number of ears to gather data on the different ear types and sizes. From the data, Apple then created an optimum one size shape design that would cover a broad set of the population.

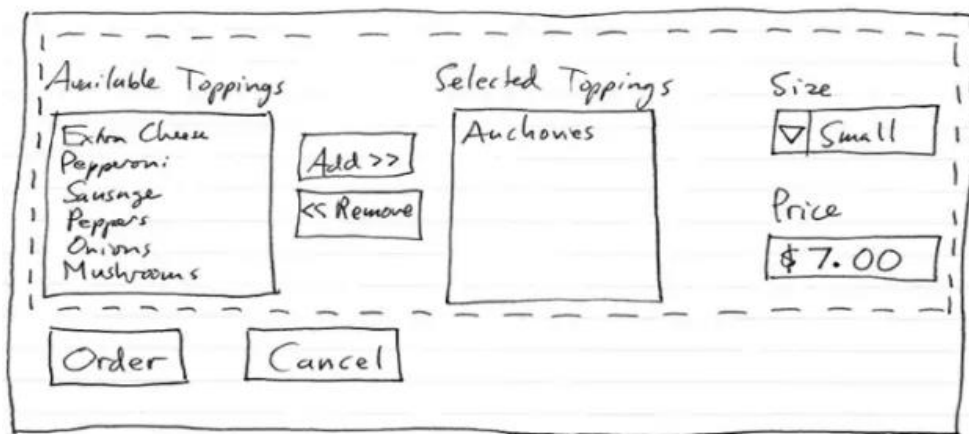
(Success of Apples' AirPods, 2023)

The Processes and Technologies which the company used to carry this development forward

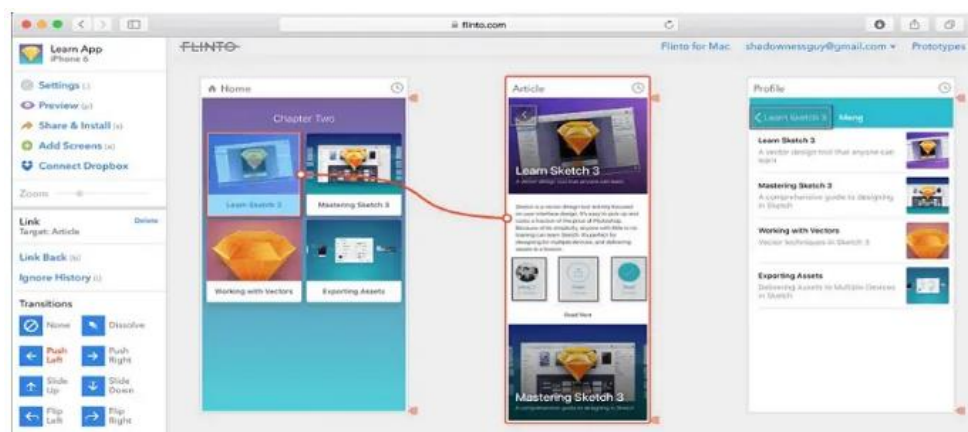
New Product Development Process

Apple are known to design products that are simple and easy to use, the same applies to their product development process. British designer Jonathan Ive, who was the Chief Design Officer (CDO) at Apple, gives a summary below of the processes and technologies used within Apple to carry the design forward from product concept through to launch. (Apples Design Tools, 2017)

Firstly at the brainstorm stage where people express their ideas for new product concepts, it's as simple as using a paper and pencil drawing. This approach gives people the opportunity to express their ideas quickly without having to worry about using difficult tools, which might hinder their thought process.



When a product concept is agreed by seniors to take forward, a team of designers is set up to focus on developing the design. At prototype stage the designers generate sketches using rapid prototype tools such as **Principle** or **Flinto** to enhance interactive designs. This is a quick and easy way for producing the designs to have a feel of what the product will look like.

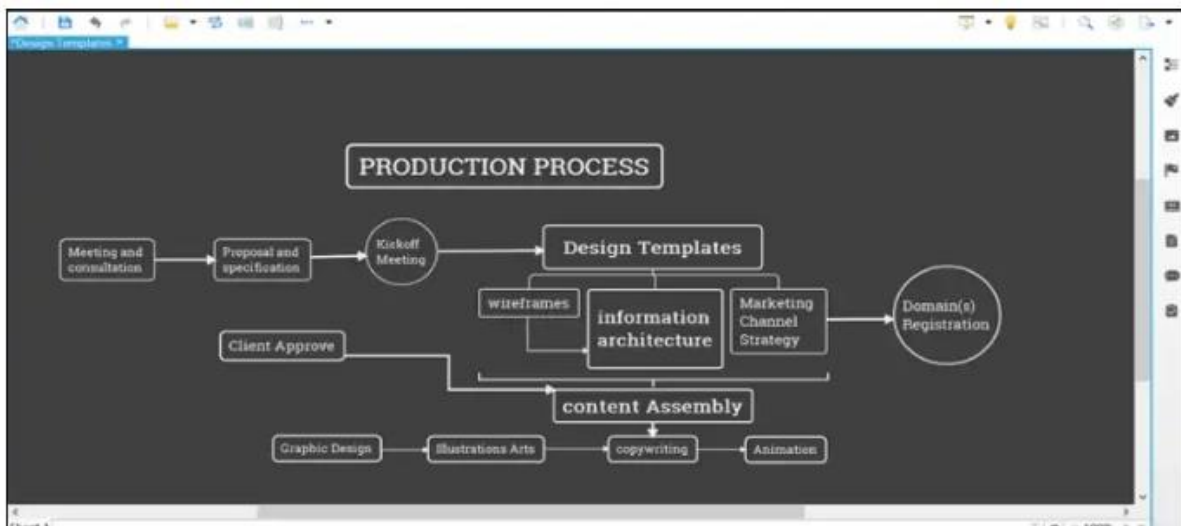


10 -3 -1 approach: designers are encourage to come up with 10 different simulations to expand their ideas, the 3 are chosen for detailed study before the final 1 is chosen to go forwards

Once the prototype design is agreed with executives, the team follow 'Apples New Product Process' (ANPP) which is a document that details all the activities required during development, who is responsible for what and when it needs to be done by. The document is controlled and files are shared using a software called **dropbox paper**, an online platform for sharing data between employees.



From the ANPP where various mapping of the product / innovation is required, a software called **Xmind** is used to handle this, where flow charts etc can be generated. The same software can be used to handle any further brainstorm ideas, where each item is recorded and shared with others. These are review weekly by the management team (further details on management procedure is shown in section 7).



The extent to which the development relied on resources external to the company and the ways in which the deployment of these resources was managed

As previously noted as key determinant, Apple relied on Stanford University to 3D scan various ear types and shapes to come up with that optimise shape design that would comfortably fit a broad percentage of the population.

Another area where Apple does not specialise in is manufacturing. Instead, Apple outsources its manufacturing / assembly operations to a range of companies such as Foxconn (one of the largest employers in the world for electronics) to remove the additional strain that comes with it. The AirPods are assembled by a company called **Luxshare** based in China. China region is considered a low cost country where manufacturing cost are kept low, which improves the product marketability a great deal, and a lot of the electronics companies have followed suit since.

(Apples's Product Development, 2023. Apples's list of Suppliers, 2022)



Apple's CEO Tim Cook visits Luxshare production line where AirPods are assembled

Airpods are Apples most complex product to assemble so far, with more that 100 components to assemble into a small ear bud. With the vast majority of suppliers in China, Apple rely heavily on each electronic manufacture to deliver high quality products.

(Luxshare Production Line, 2020)

How management overview of the development was maintained

Apple is well known for bringing successful products to the market such as Mac, iPhone, iPad and now the most recent AirPods. One of the key elements for their success is how their organisation structure is set up and the procedures they follow taking the product concept through to production. Firstly, the Chief Design Officer (CDO) and his team do not report to finance, manufacturing etc. They have their own budgets set and the freedom to come up with a design that's innovative. When a new product is brought to attention the team are cut off from other Apple employees, sometimes practically blocked for any interaction with others, so that they can purely focus on the design rather than doing day to day activities. Apple's New Product Process (ANPP) is a document that's implemented at the start of the process detailing everyone's responsibility at each stage of the development, and a timeline of when each activity needs to be complete. Every Monday, the projects are reviewed by executives to remove any roadblock allowing the project to move forward. This might seem time consuming to some companies, but what Apple are good at is keeping the number of projects to a minimal, only focus on the ones that they believe will be a success. Too many project at one time leads to complexity, and this is the complete opposite to what Apple achieve within their products.

The Engineering Program Manager (EPM) and the Global Supply Manager (GSM) are responsible for taking the product design forward from concept to production. Products are built, tested and reviewed, and quite often there will be further modifications to the design for improvement. Therefore, the product assembly and test is repeated until the team are happy with the outcome. When complete the tested products are taken by the EPM back to Apples headquarters in Cupertino, where the product is reviewed by senior executives, and if approved, goes ahead for launch. Above all, the Apple management team take the secrecy of the design extremely seriously, it's documented within the ANPP that if employee loses or leaks design prior to launch day then they are immediately fired. (Apples's Product Development, 2023)

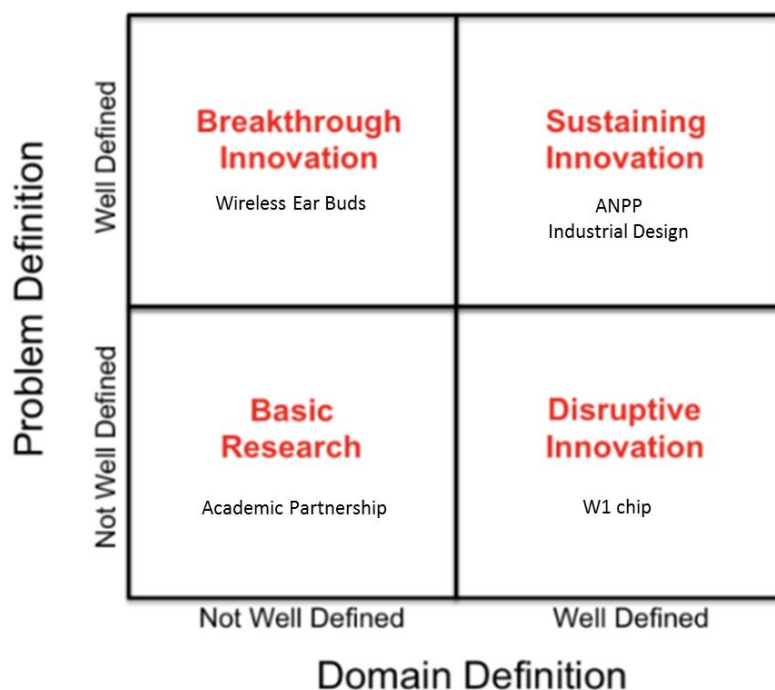
However, having a strict secret policy did have an effect on some employees, one employee said "How do I operate like this? If I can only share information with certain people, how do I know who and when? I don't want to end up fired or in jail." Former Apple HR advisor Chris Deaver saw that this had an impact during AirPods development, where friction was caused between employees at eleventh hour before launch resulted in 6 hour daily meetings. Chris took on the initiative to implement a braintrust approach (adopted from his previous firm: Disney) to each department where transparency meetings took place weekly to share any challenges they were facing. The results from the activity were positive and had a shift in the working culture within the company. (Overcoming Culture of Secrecy, 2022)

The extent to which the Innovation Process represents best practice

In this section the innovation process within Apple is looked at with reference to Greg Satell's 'Mapping Innovation' book and Paul Trott's 'Innovation Management and Product Development' book to see how the process represents best practise.

(Satell, G 2017, Trott, P 2012)

Greg Satell's main insight towards innovation is solving a problem, how well the problem is defined (problem definition) and who will solve the problem (domain definition). This is then mapped onto an innovation matrix shown below;



Breakthrough Innovation: The problem is clearly defined at the beginning, to design a wireless ear bud, an extremely challenging task. Once achieved, it will be a breakthrough innovation, a first to the market.

Basic Research: A partnerships with Stanford University to help define the optimum design for ear bud shape.

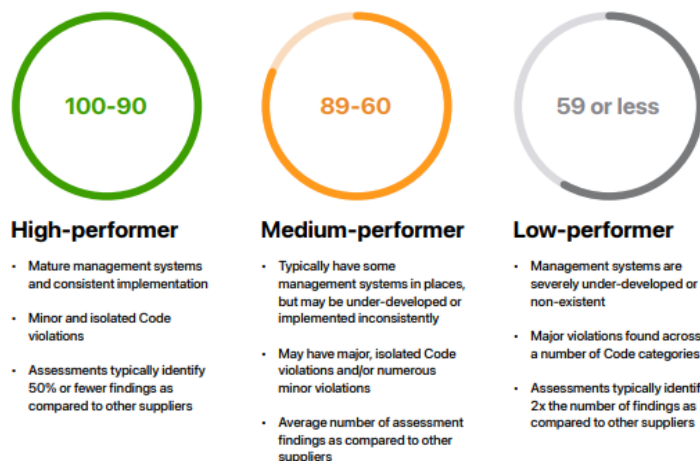
Sustaining Innovation: Apples New Product Process (ANPP) defining the necessary steps to take the design forward by the industrial design team.

Disruptive Innovation: Apple decides to develop a new W1 wireless chip to handle the connectivity, power consumption from battery, for the first time.

From Paul Trott's point of view, innovation needs to be viewed as a process not just an idea or an invention. It is how the idea or invention is taken from concept through to implementation, what factors does the company need to consider? Circular concepts of how the company gathers information over time. As noted in section 4, Apple used Stanford university to 3D scan a number of people to obtain various ear shapes. Information was gathered over time that was used towards the development of AirPods. Developing linkages and partnerships with having necessary capabilities. The design of AirPods were new but manufacturing process of how the electronic components went together was something that already existed, mostly in East Asia. Therefore, Apple relied on the supplier **Luxshare**, who have the manufacturing knowledge and expertise, to assemble the AirPods. Service Innovation: Documents are created by Apple to track the performance of suppliers to ensure product quality using a scoring system shown below;

Measuring supplier performance and improvement

In order to identify potential risks and determine the effectiveness of our supplier engagement, we track each supplier on a 100-point scale, which reflects the frequency and severity of non-compliance discovered during assessments.



(Apple Supplier Performance, 2021)

Greg Satell and Paul Trott both view innovation separately, but it's just a way of measuring innovation, same as using a vernier caliper as oppose to a tape measure to measure the length of an object.

Findings in our assessments are categorized by level of severity:

- 
Administrative Non-Compliance
 Denotes policy-, procedure-, training-, or communication-related findings.
 Examples of administrative non-compliance include:
 - Inadequate record-keeping.
 - Inadequate documentation of policy or procedures.
 - Insufficient training on policy.
- 
Violation
 Denotes non-compliance with our Standards.
 Examples of violations include:
 - Insufficient provision of benefits.
 - Inadequate pre-placement / on-job / post-employment occupational health exams.
 - Inadequate environmental permits.
- 
Core Violation
 Suppliers are required to immediately remediate any Core Violation.
 Beyond immediately addressing the violation, suppliers must also make changes in their management system that address the root cause of the violation. To retain our business, they must also take and sustain preventive measures to ensure the violation does not reoccur.

92

An evaluation of the success of the chosen innovation

For years, Apple have been known for creating innovating products such as Mac, iPhone and iPad, and once again have shown their courage to develop another innovative product, which is disruptive and new to the market: **Airpods**. The knowledge and technical skill set they have developed over the years have allowed them to develop another technological device. The theme taken from the analysis is to keep things simple, with the design, the working procedures and management structure, which make peoples life easier. However let us not underestimate the challenges the company faced to develop a wireless audio device, not just getting the connectivity to work between iPhone and both ear buds, but have managed to design the device within such a confined space.

On the company structure, it is interesting to learn that the design team are cut from the rest of the business once a design concept has been agreed to take forward. Even separated from manufacturing, where some companies see manufacturing an integral part of the product development. This allows the designers to focus on the product design without being distracted, and have the freedom to come up with a design without having a set budget.

Having an open approach to innovation by relying on external sources is also key to their success. By having manufacturing outsourced gives Apple employees the focus required for designing innovating products, and at the same time cuts down on costs for marketing.

The success of the W1 wireless chip used inside Airpods has also had a knock on effect to other products. Beats, a headphone company in partnership with Apple also include the W1 chip in their headphones (Beats Solo3 Wireless, Beats PowerBeats3 Wireless, BeatsX).

(W1 chip explained, 2022)

Overall, innovation has been used throughout the process, not just with the idea at the beginning of cutting the wire off earpods making them wireless. The internal procedures, technology and processes, external sources, have all played an integral part in making this product a success. Introduced as an optional accessory for iPhone7 at the beginning in 2016, Airpods have since been a huge success, exceeded Apples expectation in terms of sales. They have changed the way people connect to their iPhone due to the convenience and mobility for wireless.

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