



INTRODUCTION TO INNOVATION MANAGEMENT ASSESSMENT B

ACPA7005

Abstract

Critically evaluate the uncertainties and technical/business risks inherent within
Dyson's innovation-based activities

Steve Cope (2134156)

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Introduction

James Dyson was not a high achieving academic at school, but his teachers recognised him as an intelligent student, an artist, and the potential to be a long-distance runner. He was unsuccessful at getting a job after leaving school and ended up studying design in the Royal College of Art.

After meeting at college, Jeremy Fry and Dyson worked on an amphibious vehicle project for Rotork. The project was a success and they managed to sell over two hundred units per year. For his hard work Dyson was awarded the Duke of Edinburgh's Special prize in 1975.

Despite Dyson's success with the Sea Truck, he set up Kirk-Dyson to sell his ball barrow. He borrowed money against the mortgage of his house, secured investors, figured out how to manufacture the product and set up production in a barn close to his home. The idea won a British Kite award for design and featured on the BBC's Tomorrow's world.

While powder coating the frames for the Ball Barrow, Dyson became frustrated by the amount of downtime caused by the filters in the spray booth and after some research he found cyclonic separators were used to extract dust from the air. Dyson sketched the design they were using at a sawmill and made one for his own factory.

Even though the Ball-Barrow was a breakthrough innovation with reference to the Innovation Matrix (Sattel 2017) it did not perform well in the commercial market, in 1979 the shareholders of Kirk-Dyson voted Dyson out of the company. Having been obsessed with the cyclonic separator, he was determined to go it alone.

Principal Drivers

The bad experience of being voted out of Kirk-Dyson, taught Dyson not to sell out to shareholders because he'd lost five years of his hard work and no longer owned the patents or licences to his innovations. Dyson had total believe in his bagless vacuum with cyclonic separator. Considering what he learnt from his previous products he knew how he wanted to structure his business around the vacuum.

Knowing that he wanted control his business and own all the patents for his ideas, Dyson set up a workshop in his coach house and painstakingly designed and produced 5127 prototypes before producing a design he was happy to put on the market. With a mortgage and three young children to support, Dyson was in dept, living off an overdraft and the income from his wife's art school. He was desperate to make this project a success.

When he had secured the patents, Dyson licenced them to Apex in Japan and Iona in Canada. He also tried but failed to secure a deal with Amway in America. To sell the licences to Amtech Dyson disclosed all the technical drawing and prototypes only for Amway to copy the idea. This devalued the licencing deal with Iona which started a five-year legal battle with Amway and the manufacture Bissell in America. Towards the end of the trial Dyson was about to give up but his wife Deirdre pushed him to keep fighting and shortly after Amway and Bissell settled with a million dollar pay out.

When the licences and black cloud of the legal case were over, Dyson was determined to take full control of his invention. The big UK manufactures wouldn't licence his design because they would lose the revenue generated by selling the dust bags. When looking into the industry he noticed there had been no innovation for years, so he decided to produce and market the product himself. He could make the bagless vacuum a major selling point.

The barriers and risks faced by the company in developing this innovation

Barriers

Dyson faced many barriers when trying to bring his DC01 Vacuum cleaner to market:

- Very limited resources
- Large UK Manufacturers didn't see the value in his product
- Idea was plagiarised by the American company Amway
- After the court case Investor pulled out of the company
- Dyson had a poor credit rating so had to pay the £900,000 for tooling up front
- Subcontractors Philips Plastics Rising prices
- Court case to get the tooling back
- The WDA wouldn't give him a start-up grant
- Sales people not promoting the DC01
- Large retailers wouldn't stock the DC01

Risks

Dyson took huge risks in bringing his innovation to market:

- He started to develop the DC01 before he had a market
- Reengineering every part of the DC01
- Produced a product with a radical aeronautical design
- Ignored market research and trends of the time
- He had no money coming in and only one investor to fund the project
- His idea went against the proven science of the time
- He risked licencing his patented technology (Trott P.1998)
- Sueing a giant American company, in America
- Deciding to produce and sell the DC01 after his investor pulled out
- Manufacture the DC01 when Philips Plastics put the prices up
- Advertise and promote the DC01 himself

The key determinants in the process of committing to develop the innovation

When Dyson discovered the potential of the cyclone separator, and the Ball Barrow wasn't a commercial success, he tried to convince the board to capitalise on their loans and pursue the vacuum. They didn't like this option and it put added pressure on their relationship which was another reason they voted him out of the company.

Being voted out allowed Dyson to pursue his ideas his way, instead of spending energy persuading shareholders he could put his efforts into developing them. He used a painstaking series of iterative designs and by changing just one variable he could understand exactly how each affects the product.

Having only one investor, Jeremy Fry, Dyson had to licence his product to fund the project. This business model working ok until Amway copied his design. Following the court case Jeremy pulled out which forced Dyson to pivot his business model and manufacture the product on his own.

Dyson went to Italy for the tooling, but he had learnt from other projects that the Italian toolmakers would subcontract out large projects to smaller companies and charge a premium. So, he split the order and distributed to several companies. He also knew they would charge an extortionate amount for every modification that they made after signing the deal. With his extremely tight budget, Dyson instructed his team that all the designs needed to be perfect and if not, any modifications would have to be done when the tools got back in the UK.

He subcontracted the injection moulding to Philips Plastics. He worked with the suppliers to ensure the quality was to his standard by having Dyson employees at the Philips site. This worked well for a time, but he pivoted again when the American owners tried putting the manufacturing prices up. He decided to produce the DC01 himself.

Without anywhere to produce and store the products Dyson was forced to make a quick decision and lease a disused royal mail depot. As the sales and demand for his product soared, he had to expand the facility with portacabins and a tent. Despite this Dyson preferred having production in his own factory because he could analyse and streamline the production process.

When the product finally hit the market Dyson was still pushing for better sales, so he took to running demonstrations and training for the retailer's staff. He wanted to make sure they knew all the advantages of his product. Dyson even battled with the retailers to allow him to add stickers to his product to outline the benefits.

The processes and technologies which Dyson used to carry the development forward

From early in his career Dyson showed he was an autodidact (Wallace S. 2015) and used an Edisonian, trial and error method of development (Michael E. et al 1990). He applied these principals to produce 5127 prototypes. From his R&D Dyson understood every aspect of the cyclone separator.

In the DC01 vacuum there weren't many brand-new inventions but what Dyson was able to do was reengineer existing technology and apply it to his product in an innovative way. For example, the cyclone separator had been used in sawmills, mining, and the dairy industry (Hanningfield 2022) on a large scale for years. What Dyson did was, refine the technologies and apply them to the DC01.

Dyson researched the best methods and materials for producing the parts of the vacuum cleaner. Instead of using polypropylene, like the market leaders, his research showed ABS and Polycarbonate had more of the properties he wanted in his product. He wasn't interested in the cheapest but wanted the best, his idea was to use the best materials possible but design the product to use as little of them as possible.

When Dyson was putting the final touches to his product, he wasn't afraid to buck the trends and market research of the time. One major trend was wet and dry vacuums, but Dyson found this solution clumsy. He developed a dry shampoo that was just as effective without soaking the carpet. The market research was pointing out that the consumer didn't want to see the dust in a clear drum, but later surveys showed this was one of the most talked about features.

Testing the product was a big part of what Dyson did to the first prototypes. He hit them with hammers, threw them downstairs onto the cobbled floor. He devised a test rig where the DC01 would run on a treadmill of carpet for days. He would then look at the worn parts to improve them.

When in production Dyson continued to improve not only the product but also the production line and processes. Dyson employed lean manufacturing and six sigma techniques to get his employees to produce 100 DC01s per day. He was never satisfied and continued to improve all aspects of the business.

External Resources

To try and speed up his research Dyson talked to an expert in cyclone separators, Dr R. G. Dorman of the GRS in Porta Down, who informed him that from his work (Dorman 1974), a cyclone could only work with particles down to 0.020mm. For Dyson's idea to work he needed separate household dust which is 0.003mm. Dyson got his old maths teacher Paul Colmbay, to help prove the scientist wrong. They soon found out that the five different calculations were inconclusive and had to resort to empirical testing to find the answer.

Following his normal process of R&D Dyson tested different types of motor for the DC01 and discovered the motor the Japanese used of their version was the best fit. It wasn't as powerful in wattage as some of the competitors, but it was the most efficient and reliable. By removing the inefficient bag Dyson's DC01 had more suction with a smaller motor.

The first business model Dyson followed was to licence his ideas for other companies to produce. He had mixed success with this strategy the Japanese company Falcon was the first to make the product and then Iona in Canada. It all went wrong when Amway copied the design in America.

After pivoting his business model to produce the DC01 himself, Dyson sourced all the injection mould tools from Italy. He had learned from the Ball-Barrow that if you placed a large order with one toolmaker, they would subcontract it out to smaller companies and charge a premium, so Dyson split his order between several toolmakers. He then had all his components moulded and assembled at Philips Plastics in Wrexham

Richard Needham minister for trade visited the factory and asked Dyson how he could grow his turnover from £3.5million to £50million in 12months. The answer was to get into the mass market trade. Needham arranged for Jefery Howe to visit the factory, Jefery's wife was on the board at Comet. The next morning Dyson got a call from byers at comet wanting to stock the DC01, Curry's and Argos followed suit. The turnover went £3.5million in 1993 to £85million in 1996. Giving Dyson 55.8% share of the upright cleaner market.

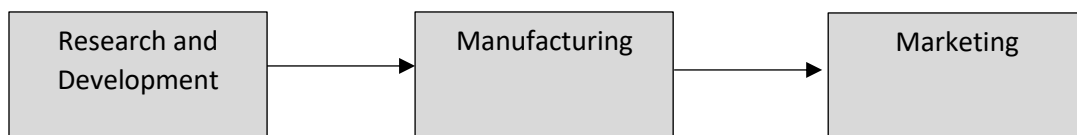
How management overview of the development was maintained.

From Trott's work he tells us "Projects frequently would be passed back and forth between functions. Moreover, at each interface, the project would undergo increased changes, hence lengthening the product development process. (Trott P. 1998) To overcome this problem, Dyson took on all the roles within the business. As things grew, he employed young design engineers from his old college, RCA. By keeping the team small they could make decisions quickly. They could come up with an idea, produce the design, manufacture, and test the prototype the same day.

Dyson used what is described by some academics (Trott P. 1998) as the Technology push method of Innovation (see figure 1.1). Traditionally a scientist would come up with a breakthrough invention, a designer would turn the idea into a product an engineer would work out how it's made, and marketing would sell it to a consumer. In Dysons case he took on all these roles and ended up seeing his innovation through every stage.

Figure 1.1 Linier Innovation Model

Technology Push

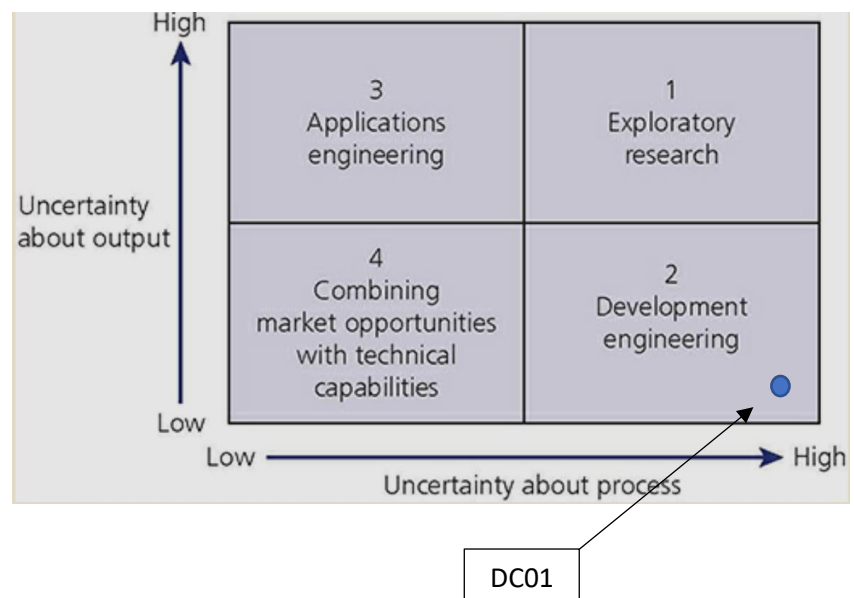


Trott, Paul. Innovation Management and New Product Development (p. 23). Pearson Education. Kindle Edition.

Figure 1.2 Pearson's Uncertainty Map

Risk Management

When we put the DC01 into (Pearson, A.W. 1991) the uncertainty map, Dyson took a very pioneering if not reckless approach to risk management. All the odds were stacked against him, but he had a clear vision of the product and what he wanted it to achieve.



Looking at how Dyson managed the DC01 project against the criteria of the innovation management tools (Trott p. 1998). He covers most of the criteria well, except the co-operation and networking. He didn't like relying on external resources and brought everything in house as quickly as he could.

Figure 1.3 Innovation management tools

Knowledge and Technology	Dyson reengineered and tested virtually every component in the vacuum. Even though it was expensive he tried to patent all his ideas and designs. His thorough approach to R&D meant that he knew every aspect to the DC01.
Market Intelligence	After finalising the design of the DC01 Dyson continually analysed his competitors and noticed there had been no innovation in the industry for years. However, he did buck the trends and market research.
Co-operation and networking	Everyone in a product team is dedicated to delivering their product on time, all the necessary specialists. There are many other experienced employees that can parachute into a team to help resolve a problem. Dyson brought external resources in house so he could refine the processes.
Human Resources	Dyson kept a flat management structure, to help to empower individuals to make decisions quickly and get things done. He ensured teams were full of the right people who they know their roles and responsibilities. There is also a lot of crossovers with people understanding each other's roles in detail. Giving the team a clear purpose, understanding and direction allows Dyson employees to use their expertise to maximum effect
Creativity Development	Dyson employed mainly young and talented RCA graduates. He liked this kind of employee because they were lateral, out of the box thinkers and had not been influenced by any other narrow-minded organisations. Dyson engineers are continuously doing things they have never done before. They solve problems every day failing, learn from the results and moving forward quickly.

(Trott P, 1998)

The extent to which you feel this innovation process represents best practice

Dyson used the Innovation Funnel (Goffin K, 2021) as part of his everyday R&D. He would come up with ideas to improve various parts of the DC01 and test to see if they would be implemented. During this process he had several spinoff innovations like dry shampoo and the cyclone to filter diesel exhaust fumes.

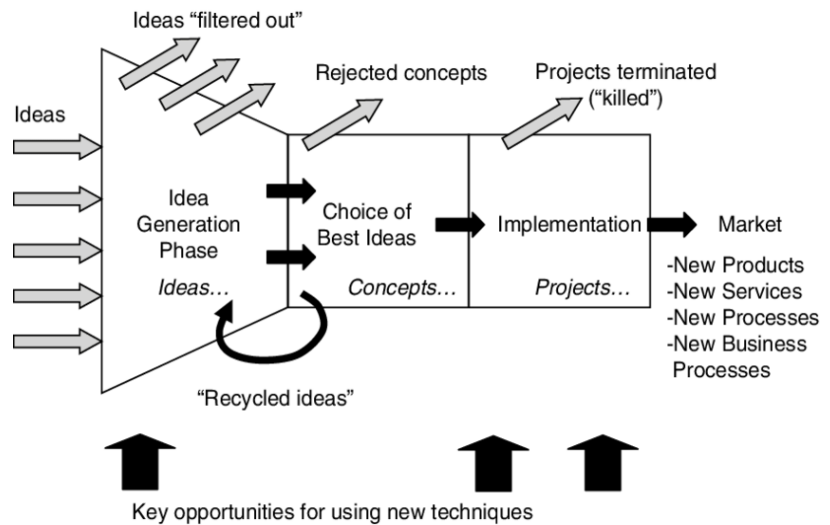


Figure 2.1 Innovation Funnel

Innovation Audit

To effectively measure innovation performance (Trott P, 1998) suggest carrying out an innovation audit. Based on the information regarding Dyson, it scores well on most of the criteria except for Cross-functional co-operation because Dyson wanted to keep things in house.

Figure 2.2 Innovation Audit

Category	Very High	High	Average	Low	Very Low
Growth Orientation		X			
Vigilance		X			
Commitment to tech	X				
Assemble Knowledge	X				
Acceptance of risk	X				
Cross-functional cooperation					X
Receptivity	X				
Space for creativity		X			
Adaptability	X				
Diverse range of skills		X			

(Trott P. 1998)

Pivot

Coming from a perspective of (Sattel G 2017) every start up should have three phases customer development, minimum viable product and then pivot. Dyson didn't pay much attention to the customer development stage, his total believe in his product meant he knew as soon as he could get the DC01 to market people would buy it. To get the product to market he needed to licence his ideas for manufactures to produce. To get them to pay for his intellectual property he needed to make the best product he could come up with. What he did that agrees with best practice was to pivot his business until he found something that works. See the business canvas models (Osterwalder A 2010).

Figure 2.3 Business Model Canvas

First Model

Key Partners  Iona Falcon Jeremy Fry Philips Plastics Italian Toolmakers	Key Activities  R&D Advertising	Value Proposition  Bagless Vacuum 100% suction 100% of the time Flawless operation Iconic design	Customer Relationships  Lifetime warranty Iconic Design Fashion Icon	Customer Segments  Niche Market Middle Classes Foreign Licensees Design Clients
	Key Resources  Coach House Patents Italian tooling		Channels  Mail order Designer Outlets Overseas markets	
Cost Structure  R&D, Subcontract Assembly Subcontract Molding, Patents, Expensive Materials			Revenue Streams  Foreign Licenses, Single Point Sales, Subcontract design	

Final Model

Key Partners  Iona Falcon Italian Toolmakers Japanese motor manufacturer	Key Activities  R&D Production and Assembly	Value Proposition  Bagless Vacuum 100% suction 100% of the time Flawless operation Iconic design	Customer Relationships  Lifetime warranty Iconic Design Fashion Icon	Customer Segments  Niche Market Foreign Licensees General Population
	Key Resources  R&D/Assembly Plant, Patents Italian tooling		Channels  Mail order Designer Outlets Overseas markets Mass market	
Cost Structure  R&D, Subcontract Molding, Patents, Expensive Materials			Revenue Streams  Foreign Licenses, Single Point Sales	

(Osterwalder A, 2010)

Critique of the innovation process

I think the DC01 was a successful innovation because Dyson had a clear vision of his product and a determination to see it succeed, he pivoted and changed direction to get this business model to work. He overcame a lot of setbacks with the competitors trying to discredit his product. He spent very little on advertising and didn't try to compete in a price war because he had total faith in his superior product.

The latest theory regarding innovation is that it should be open (Chesbrough 2003) involving external research and pulling in different types of expertise to speed up the development. Dyson went in the total opposite direction because he didn't have shareholders or investors to satisfy. He was able to take a long and painstaking approach to R&D, understand every piece of the technology and produce a well designed and engineered product. He continually brought everything in house so he could refine the products and processes. He dismissed the experts, ignored market research, bucked the trends of the time, and pioneered his own path to success.

My conclusion is James Dyson's approach to innovation management has been a paradigm shift in his industry and the way he approaches a project will reliably come up with innovative solution.

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