

'Dark Engineering' - A Case Study in Engineering Entrepreneurship



When Milo Minderbinder started M & M Enterprises in Heller's cult novel *Catch 22*, he was convinced he could make fortunes for everyone in the US Air Force, and he did, but he also lost fortunes by taking too many crazy risks. Milo was driven by a vision – to make everyone in the US Air Force so wealthy they would forget about the war.

Mark McHutchon and Mike Blackmore are also driven by their own vision - to provide mountain bikers with bike parts that perform superbly, last for ages, are environmentally sound, and are made in the U.K.

However, they now face their own 'Catch 22'. Can they transform the initial interest in their innovative new product ideas into a sustainable and profitable business? Will their newly formed company 'Dark Engineering' become the successful and ethical enterprise that Mike and Mark are hoping for?

A dark and dirty beginning

A happy co-incidence put Mike and Mark together in the same hall of residence on arrival at university, and the two quickly became friends as they are both mad keen mountain bikers. Mad in the sense that they go riding all year round, rain or shine, mud or more mud, uphill and down dale. In the depths of winter they add an impressive array of lights so that they can carry on, business as usual, dirt biking in the dark! Less mad, perhaps, was their decision to study engineering, which Mark says came about as his favorite subjects were maths and physics, and he felt that an engineering degree would offer him the opportunity to apply this interest in a real way to real problems. He also felt that the all round education would stand him in good stead for the future.

The start of a new M & M enterprise?

Having to survive on student loans and part-time jobs, Mike began to get very frustrated by the short service life of many of the expensive components he was regularly replacing on his full suspension bike. He also wondered if there was an altogether better way to re-design some of these 'standard' components to make them both more reliable and more environmentally friendly. While downhill biking is a relatively new sport, many of the components have been handed down and modified from more traditional cycling and motorcycling and Mike was finding that many components were just not up to the job. For example, on a long descent, the normally highly effective disc brakes can get so hot that they become ineffective and riders are regularly forced to stop for a break while their bikes cool down. Other parts just do not seem up to the task of working all year round in the best conditions the great British winter can provide. Mike therefore began using his newly acquired engineering knowledge to create some designs for key components and he soon had a couple of innovative new ideas for a brake rotor and a front wheel hub.

Meanwhile, Mark had also been concerned by the cost of the specialist replacement suspension parts imported from the USA. During one of his summer vacations he took the opportunity to get involved in the Shell STEP initiative (www.step.org.uk), a UK-wide programme offering undergraduates project-based work within small to medium sized businesses. As a result Mark found himself working at SS Bright Drawers of Sheffield looking into material property changes in stainless steels and titanium alloys as a result of cold drawing. The opportunity to work in a real, small engineering company and see how the

whole business process works first hand was invaluable. On returning to University, Mark started to think about making the crucial suspension springs. He felt that he could produce them at a reasonable cost, of higher quality, and with the attraction that his version would carry a 'Made in Britain' tag. (He noticed that many of his fellow bikers often boasted about the 'Made in Britain' tag when showing him their new bikes.)

PhD Research

After completing their undergraduate degrees both Mark and Mike were offered the opportunity to carry out PhD research which they were both keen to accept. During their first year of research they became aware of the University's annual business plan competition. They agreed that between them, they might have enough ideas to form the basis of a potential business, and that the first prize of £10,000 could help to pay for the costs of developing their ideas into saleable products. So they decided to give it a go, and submitted a brief proposal that won them through to the second round of judging. This is where things started to get a little more serious, and they needed to quickly produce a full blown business plan to convince the judges (and themselves) that they did indeed have the makings of a potential business.

Intellectual Property Rights

However, at this point they were almost stopped in their tracks. A colleague at the university suggested to them that while their plans had merit, and may even become the basis for a successful business, they would not necessarily be able to do so because the university held the rights to all the intellectual property associated with their new product ideas. Mike and Mark doubted that this could be true, especially as neither of their research areas included bikes (Mark was studying the design process for sports equipment such as hockey sticks, while Mike was researching metal forming techniques). At this point they did their homework and dug out the agreement they had signed on accepting the PhD research posts. True, there was a clause on IPR, but it stated that IPR is the property of the university only if it is a direct result of a student's agreed programme of research. The pair argued that mountain biking and component design was not part of their research, a view which the university accepted, as it was also keen to promote enterprise among students, researchers and staff.

Freewheeling

This left the path clear to enter the competition for the £10,000 prize. All they needed now was a business plan. They found the process of writing it very self-fulfilling. They now completely believed in themselves and their ideas and they also received excellent support from the university's enterprise unit. They were feeling very positive on the final day of the competition. In the final analysis, the judges were unable to decide on two entries and decided to award two joint first prizes. The pair was delighted to be awarded £7,500 to get their enterprise underway.

Subsequently they formed a limited company - Dark Engineering Ltd. (www.darkengineering.co.uk) and have started to develop their product lines. However, with one eye on the future they both agreed to keep the venture very much part-time until they completed their PhD research.



At the heart of their new venture is their company ethos of "Products by mountain bikers, for mountain bikers, at a reduced environmental and capital cost, with real potential for growth". In addition the two founders of Dark Engineering have decided to manufacture all their products in the UK. While these sentiments may seem idealistic, Mark and Mike have made

these decisions for sound business reasons as well as personal ethical choice. They have noticed that among the many UK based component companies that have started up, those that have stood the test of time, have done so due to quality products and a clear 'modus operandi' or company philosophy governing all their products.

Their first product on offer is a straight replacement titanium rear shock spring, which is claimed to be up to 60% lighter than steel springs, offers higher fatigue limit and provides superior corrosion resistance. In addition Mark and Mike believe that their springs will offer a better resistance to 'set' (i.e. they will not permanently change shape) and provide the rider with a more supple and active spring compared to steel. Finally, while they will offer the springs at a competitive price, the other attraction is the fact that they will all be hand made in Yorkshire.

This will soon be followed with their own in-house designs for a disc rotor and a wheel hub. With all of these products the aim is to reduce whole-life cost to the consumer, improve performance and service life, and minimize environmental impact. They will do this by using and wasting as little material as possible during manufacture (a sensible idea given the high cost of titanium and other materials they will use). They will also use materials and designs that will last longer and be replaceable, thus moving away from the 'buy it, use it, and throw it away' philosophy of traditional component suppliers. Their other key selling points will be that all their products are designed to survive in all seasons in the worst of British conditions and are exclusively manufactured in the UK.

However, the two entrepreneurs don't want to stop there. They are constantly questioning every aspect of bike design, and are looking for new product ideas. For example, Mark asks why chain-rings and rear sprockets could not be made to last much longer (or at least a whole winter!) If not, then it would be worth investigating possibilities for some individual replacements, instead of having to buy a whole set. The pair also have ideas for a new, lighter, stronger rear hub, that will out-last and out-perform all those currently available, and no doubt they will solve this problem too.

Dark future?

The business does present challenges that will need to be addressed when the two founders decide to pursue it full-time. They know their target market well but have yet to put together accurate estimates of potential sales for each of their products. Their marketing strategy is sound, and they are hoping to get positive reviews from the highly influential mountain bike press, as well as providing some top riders with equipment to test out. Selling will be initially direct to customers via mail order, by personal contact or via their website, but in the future they want to use other distribution networks.

Manufacturing and operations have also been thought out. They will not begin making products themselves, but will make use of a specialist network of local precision engineering sub-contractors. Material suppliers have been identified that can provide them with the unusually high spec. materials they will be using. Creative design and innovation will continue to be provided by the founders who will use some of their prize money for software licenses that will enable them to optimize designs which can be truly at the cutting edge.

What next?

The Catch-22 that Mike and Mark face is: how can they ensure the success of Dark Engineering in the short, medium and longer term? Your views are welcomed at sales@darkengineering.co.uk

Suggestions for use in teaching

The company is currently a part-time venture while the two founders complete their PhD research. Students could discuss whether this is the right approach for this company and its founders.

Students could suggest a marketing and sales strategy for the company as it moves from a part-time to a full-time concern for the two founders. Should the company be looking for some external assistance in any key business areas?

Related Resources:

Go to: www.engsc.ac.uk/er/entrepreneurship/

All the resources here are specifically enterprise and entrepreneurship teaching materials, you may find the following particularly useful in relation to this case study:

Teachers Notes B3 – Proven Idea – Ideas (in relation to market)

Session B3 - Feasibility Study

This session explores the feasibility of idea in the market place – how can an idea be analysed to see if it is worth pursuing? A range of material is provided here to explore the customer perspective (marketing) and how an idea might be evaluated for customer interest, competition and potential to make an appropriate level of income.

Teachers Notes B4 - Proven Idea - Resources

Section B4 - Market Information

Exploring sources of data for research, particularly for legal requirements (including intellectual property rights) is the focus. Information is provided on how to gain data and information required to develop the business planning process.

Teachers Notes B5 - Proven Ideas - Strategy

Section B5 – Market Segmentation

Taking a proven idea towards business start up requires an appreciation of the customer. These slides help identify customer types and profile them using market segmentation techniques to determine if there are enough potential customers in the area.

Teachers Notes B6 - Proven Idea – Planning and Operations (tools)

Section B6 - Techniques

Techniques for proving ideas are drawn from market research and analysis of the new product development process. This session explores how information promotes effective decision making to ensure the development of sustainable new businesses.

Teachers Notes C3 - Planning and Development – Ideas (in relation to market)

Section C3 - Market Analysis

This session introduces analytical tools which explore the market and help determine appropriate strategies. The business planning process demands that ideas are developed against the market realities of customer and market trends, competitors and internal

resources and strengths.

Teachers Notes C6 - Planning and Development - Planning & Operations

Session C6 - Business Plan

The research and analysis required for drafting a business plan has been built up through out the previous sections, so this session focuses upon writing the business plan. It contains an active business plan template as well as teaching support for the plan and its elements (finance and accounting). There is also a marking scheme for using the business plan, or its component parts, as an assessment.

Teachers notes D6 - Ready to start up – Planning and operations (tools)

Session D6 - Practicalities

This session looks at the requirements of set up. Slides are provided on sources of finance and a handout regarding practical issues is included – however please ensure that this is updated regularly.

Teachers Notes D5 - Ready to Start - Strategy

Session D5 - Entrepreneurial Marketing

This session looks at marketing strategy for the small business. Building upon basics of marketing, this session focuses the planning towards the practical issues of distribution and identifying the key market for the new business.

This Case Study was produced by Ted Sarmiento of Olmec Partnerships, for the Higher Education Academy Engineering Subject Centre, 2005