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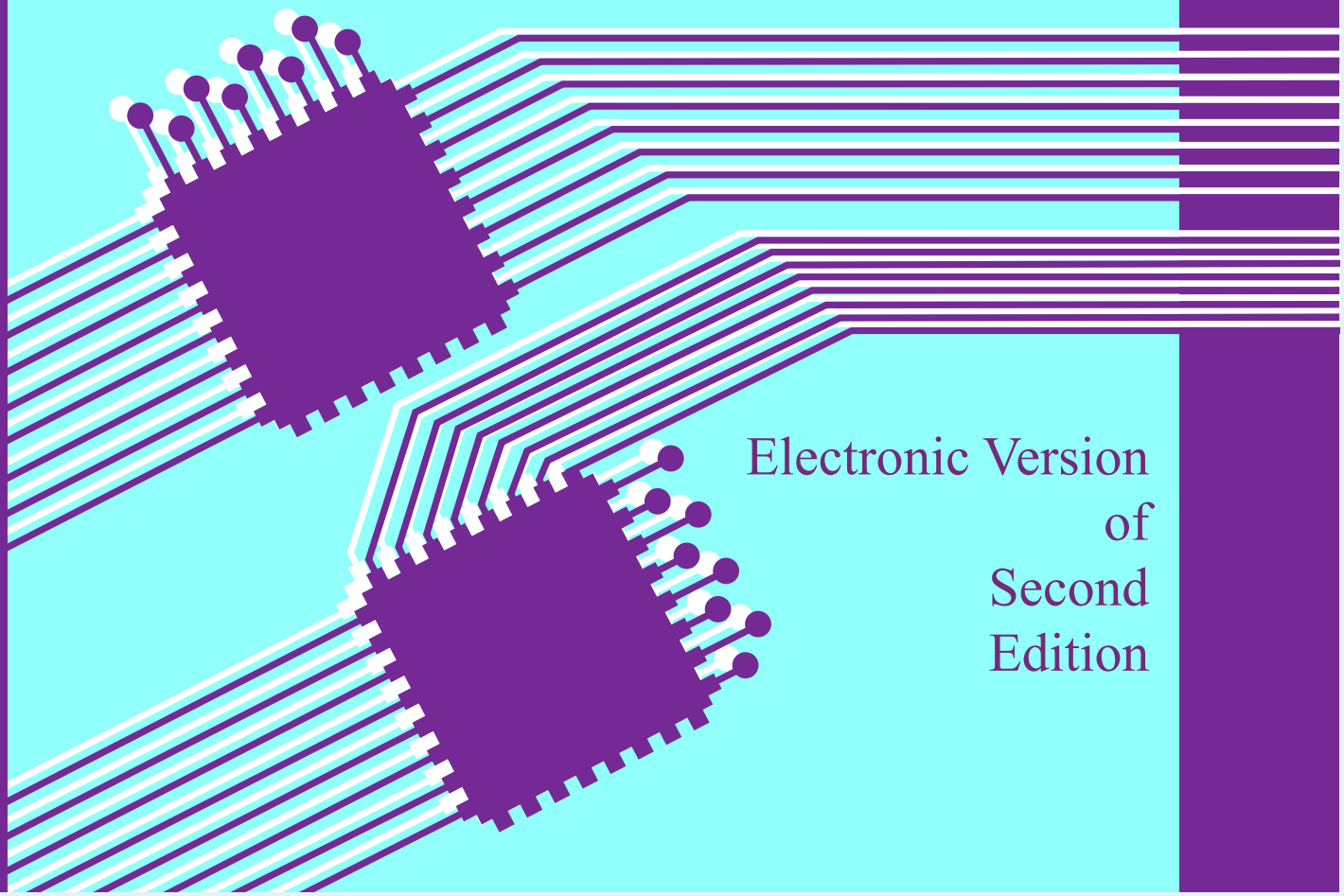
The Economics of Automatic Testing

Chapter 3
Time to market

Brendan Davis



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3.2 Demand cycles, technology cycles and product cycles

Figure 3.3 shows how marketing managers view things. They usually refer to the overall market cycle as the demand cycle. Within the demand cycle there will be several technology cycles, and within each technology cycle there will be several product cycles. A simple example I use to explain this is that of hunting weapons. There has always been a demand for hunting weapons, ever since man appeared on the planet. In those early days the demand was driven by the need for survival. Today this is still the driving force in many undeveloped parts of the world but in the so-called civilised world the demand is for 'sporting' weapons. The demand cycle has been active for thousands of years. In that time the demand has been satisfied by numerous technologies and refinements of these technologies. We moved from stones and clubs to hand-launched pointed projectiles such as the spear. Material technology moved from stone and wood, to bone, and then on to bronze and iron. Eventually a major technological breakthrough saw the development of the bow and arrow. This is turn was eventually superseded by the development of gunpowder and all of the weapons based upon this new technology. The bow still survives to this day, which simply proves that there is often a niche market for older technologies. As an aside it seems hard to believe in this technological age that the old English longbow made famous by the tales of Robin Hood was once regarded as the ultimate deterrent. In the famous battles of Agincourt and Crécy the English were seriously outnumbered, but the superior accuracy and firing rate of the longbow resulted in around 10,000 casualties on the French side and only about 100 casualties on the English side. No wonder the weapon was feared throughout Europe.

The usual pattern of product development in electronics is for continuous improvements in the functionality of the design coupled with minor technological changes. Then a major new technology will be utilised which will tend to make the older technology obsolete very rapidly. There is effectively a period of evolutionary improvements followed by a revolution followed by more evolutionary improvements and so on. Since even the evolutionary changes result in an improved price/performance ratio it is easy to see why the products tend to have short lifetimes.

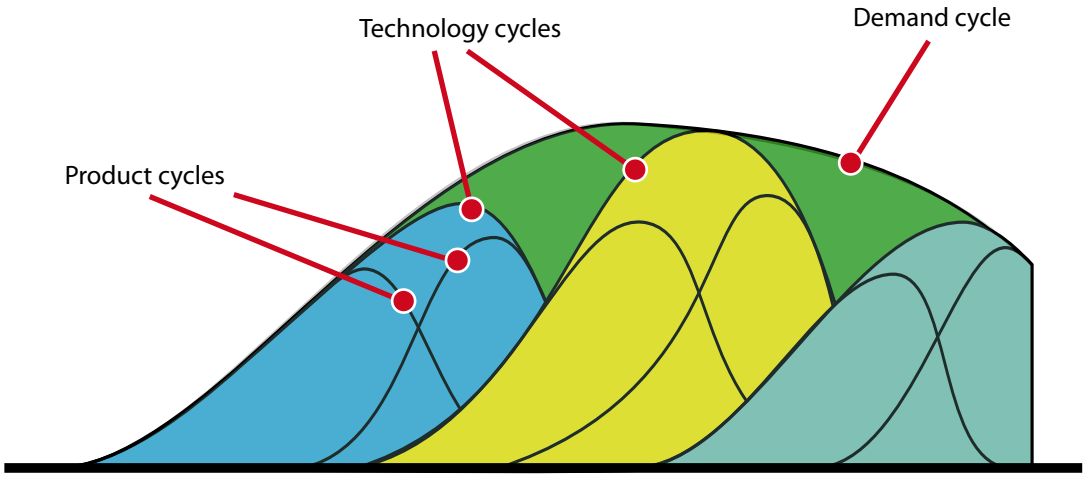


Figure 3.3 Demand cycles, technology cycles and product cycles

3.3 The ideal product life cycle

The product life cycle (PLC) is usually shown as a curve similar to the one in Fig. 3.4. The cycle can usually be subdivided into three to five regions. The simple form would consist of periods of growth, maturity and decline. In the more detailed version the growth period is subdivided into two or three regions. These are usually defined as a period of emergence (sometimes called the embryonic stage), followed by a period of rapid growth, followed by a period of slower growth. Sales and marketing professionals will study the position of a product on its life cycle to make decisions about how to promote and sell the product. Similarly, senior management should study the markets they are operating in to determine the corporate strategy of the company. You act very differently in a growth market to the way you would operate in a mature or declining market.

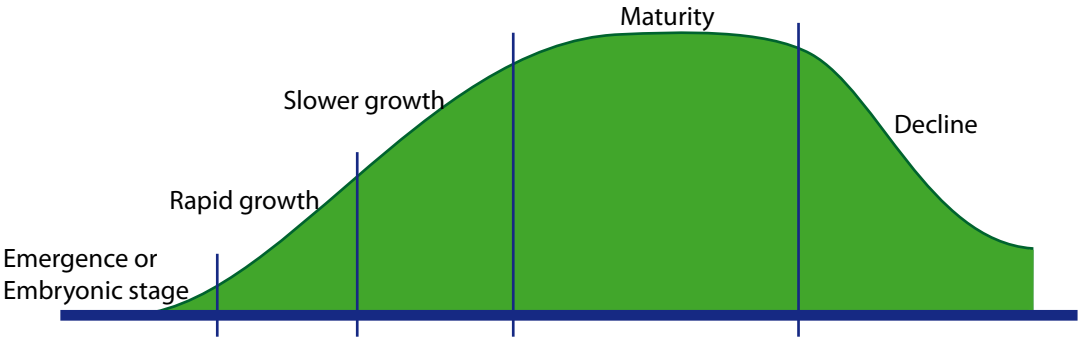


Figure 3.4 Segmentation of the life-cycle curve

The life cycle shown in Fig. 3.4 starts at the launch of the product. For a more complete analysis we also need to consider the part of the life cycle prior to the product's introduction to the market, namely the development phase. The ideal product life cycle would look something like the one depicted in Fig. 3.5. The curve has been reduced to straight lines for simplicity, and the basic three stages of growth, maturity and decline are shown. The vertical axis shows development expenses below the horizontal axis and sales revenues above. The horizontal axis indicates time. In this ideal product life cycle the development time is short, and it costs relatively little. After the product introduction the sales grow rapidly, they remain at a high level throughout a long period of maturity and then they decline very slowly.

A product life cycle with this kind of an envelope will result in low R&D (research and development) costs, high profits, predictable manufacturing operations and plenty of time to develop the next product.

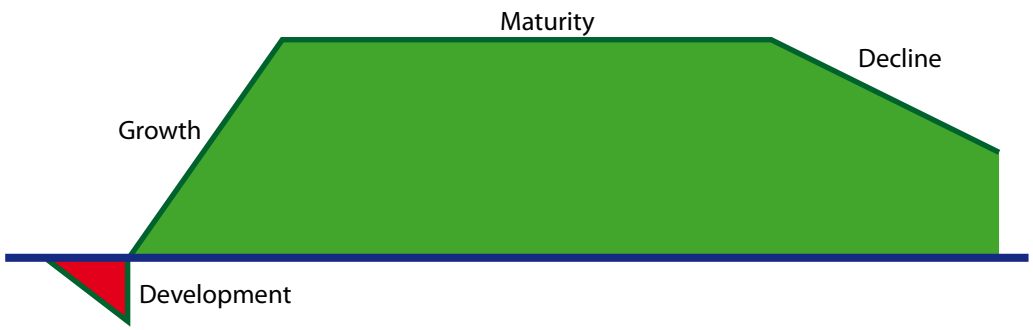


Figure 3.5 The ideal product life-cycle

Compare this to the curve in Fig. 3.6 which characterises the high-technology electronics industry. The product development time is long relative to the overall lifetime. Growth can be rapid or slow depending on the nature of the product, its ease of acceptance and the competitive climate. The maturity period is between 'short' and 'nonexistent', and the decline is rapid due to the emergence of a new technology. Looking at this curve it is easy to see why the 'high-tech' industry is also a 'high-risk' industry. Obviously the shape of the PLC will vary from project to project and this shape, in the form of a sales forecast, will normally be predicted by the marketing department. Their promotional plans will be defined to try to optimise the shape of the PLC in that they will attempt to gain rapid acceptance (growth) and a long maturity period before competitive products (or their own replacement product) causes the sales rate to decline.

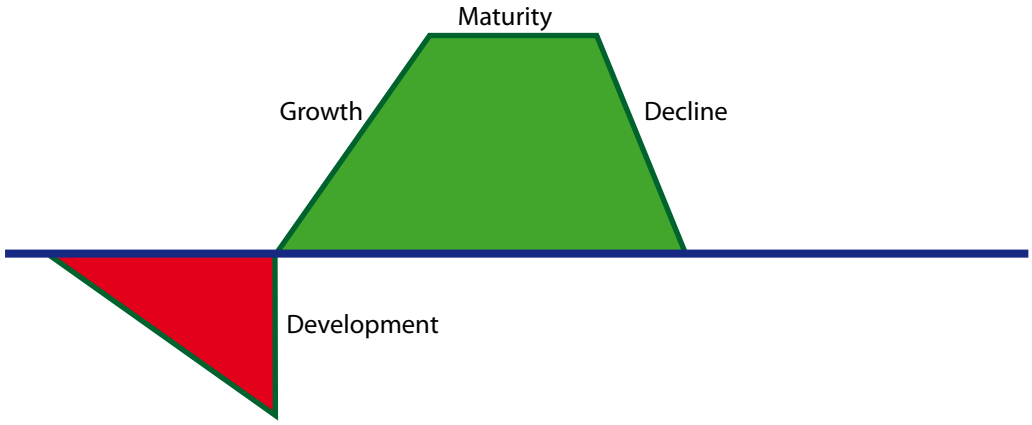


Figure 3.6 The 'High - Tech' product life-cycle

If a new product contains new technologies relative to existing market offerings then it may well have a faster growth stage. This is particularly true if the demand curve is itself in the growth stage. However, whether it is working for you or against you at any point in time, it is the high rate of technological change that results in very short window of opportunity for a specific product incorporating specific technologies. It is this simple fact of life that makes time to market such a critical issue in the electronics industry. Incidentally, the rather nebulous term 'window of opportunity' does have at least one definition. I have seen it defined as being half the expected product lifetime. In other words, you have to introduce your product in the first half of the lifetime for similar competing products using similar technologies in order to have any chance of reasonable sales. If you cannot achieve this then you may as well cancel the development project and start on the next generation product. Bear in mind the fact that the competitors who launched their current generation products six months ago will already be at least six months into the development of their replacement product.

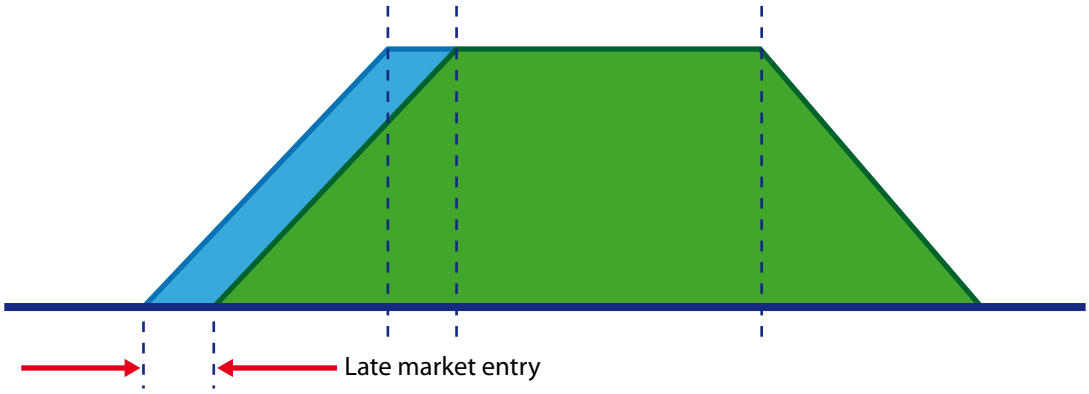
3.4 Time to market and profit

The results of a study performed in the mid eighties by the McKinsey Company raised people's awareness of the relationship between time to market and profits. In their report they gave an example of the impact on profit of several factors based on their findings. This showed that a 50 per cent overrun on development costs would reduce the lifetime profits on a product by only 3.5 per cent. A 9 per cent excess on the manufacturing cost of

the product would reduce profits by 22 per cent. However, a six month delay in product availability reduces profits by 33 per cent. This example was for a product with a life of five years, selling into a market with an annual growth rate of 20 per cent and with a 12 per cent per year price erosion. This is hardly typical for the electronics market at present. We would tend to expect a much shorter product life, less market growth and a larger price erosion. It would probably therefore be a lot worse. Unfortunately, there are very few examples like the McKinsey one available. As a result many people are aware of the importance of time to market but find it difficult to quantify the benefits. In actual fact it is not really that difficult to put some numbers to the problem. It is quite easy to construct a time to market model to determine the impact on revenues and profit using a spreadsheet program.

3.5 Modelling the effects of time to market

A time to market model can be a very useful tool to help make decisions about test strategies and test tactics. Being able to estimate the effects on revenues and profit will enable you to make the best decisions about the alternatives available to you. It will also provide additional justification to go down what may at first sight be a more expensive route. For example, you may determine that each week the product is delayed from reaching the market will result in revenue losses of one hundred thousand dollars and profit losses of between thirty thousand and fifty-five thousand dollars. Armed with this knowledge it will be easier to justify the higher cost of a better tester that can shave a few weeks off the program preparation time. Alternatively, or even additionally, it may make it easier to justify some design for test (DFT) activity that will reduce the test programming effort. How do we determine these effects on revenues and profits?



	%	Plan	Actual (S & M fixed)	Actual (S & M variable)
Revenues	100	7200	6800	6800
Research & Development (R & D)	10	720	720	720
Cost of Goods Sold (COGS)	45	3240	3060	3060
Sales/Marketing (S & M)	25	1800	1800	1700
General/Administrative (G & A)	10	720	720	720
Profit Before Tax (PBT)	10	720	500	600
All amounts in thousands of dollars				

Figure 3.7 The reduction in profits as a result of a delayed project