Network Strategy in the Digital Economy

Sammut-Bonnici, Tanya

University of Malta

2010

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

Strategy in the digital economy[1]

contents

Introduction 457

12.1 The need for a new strategic perspective 458

12.2 The emergence of a new economy 460

12.3 Networks 463

12.4 The technological infrastructure of network industries 470

12.5 Networks, standards and competition 483

12.6 Implications for strategy 484

12.7 Summary 489

Key terms 490

Recap questions and assignments 490

Case studies 491

Further reading and references 496

Introduction

This chapter is concerned with the 'new' world of information technology and knowledge intensity. This is a world marked by big investments in R&D, different cost structures and significantly changed demand conditions. You should read this chapter in conjunction with Chapter 19, which deals with knowledge, information and innovation. In this chapter we are concerned with how the logic of competitive advantage applies to the new conditions in which we find ourselves. To anticipate the conclusions, we will see that the strategic context has shifted a great deal. This means that fundamental demand and cost conditions have changed, resulting in different strategies

---

[1] This chapter is written jointly with Tanya Sammut-Bonnici.

PREPRINT VERSION

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

being pursued. The new world and the new economy does mean that the old strategic logic is outmoded. Instead we see a significant change in the strategic context that results in the logic of competitive advantage being applied in different ways.

The chapter presents and contrasts the differences between the old world of scale and scope economies and the new world of **network externalities**. There is an extensive discussion of what network externalities are and how they arise but the reader should read this in the context of addition, not replacement – scale and scope have not been replaced; there is, however, another important practical phenomenon to consider. Networks are supported by many layers of infrastructure and we go into some detail to show how the technological infrastructure can be identified and analysed. There are many implications for competition which we review. Finally, we summarize the implications for strategy – although it is a new world, the logic of competitive advantage still applies.

12.1 The need for a new strategic perspective

The new information and communication technologies of the last decade are fundamentally transforming the operating methods of most manufacturing and service companies and are provoking wholesale reappraisal of the nature of support functions. These technologies have become institutionalized in the new ICT (information and communications technology) industry across the world and are now having a revolutionary effect on corporate strategy. Executives are rethinking the strategic fundamentals of business practices not just in technology and communications industries but also across the entire spectrum of industries.

Many of the component parts of this new ICT industry, such as telecommunications, the internet, computing and software, are shaping significant parts of the corporate environment into a new 'network economy'. The essence of networks is the existence of multiple nodes, the interconnectivity between them, and the co-operative (as opposed to competitive) behaviour of the nodes. As we will see, networks have increasing returns to scale characteristics. The dynamics of corporations and the new information economy will increasingly reflect these increasing returns to scale and, therefore, understanding how such networks work is the key to developing a new set of strategies in this new information-based corporate landscape (Kelly 1998).

The 'old world' was driven by economies of scale and scope, where the benefits of size are moderated by eventual diminishing returns. The 'new world', spawned by information and communications technology, is not moderated by the normally powerful influence of diminishing returns. Network effects, also known as network externalities, can result in 'winner-takes-all' phenomena (for example, the Wintel standard for PCs) and therefore result in new industry dynamics and new sets of corporate responses (for a discussion of network effects, *see* McGee and Sammut-Bonnici 2002).

The burgeoning growth and influence of the new ICT industry is making it possible for more individuals, corporations and companies to reap the benefits of the information economy. The internet has provided a free infrastructure for the rapid exchange of information and is creating new distribution opportunities in regional and global economies. The development of the 'self-organizing' web of new economy industries is affecting all elements of trade and brings commercial gains to regional and global economies. The Digital Planet 2002 report indicates the scale of this effect. At the regional level, Eastern Europe's spending grew faster in 2001 than the North America, Latin America, Middle East and Africa regions combined. Mature economies such as the US will become less dominant, as China, Poland and a host of other developing countries play an increasing role. At a more micro level, information industries are giving rise to geographic hot-spots of commercial activity, created from economic webs, corporate clusters and commercial ecosystems. California's Silicon Valley, Taiwan and Tokyo are such examples. Local concentration of ICT activity may develop spontaneously or can be created by governments and regional planners. Malaysia is developing two of the world's first Smart Cities: Putrajaya, the new seat of government providing e-government facilities, and Cyberjaya, a city for multimedia industries, R&D centres, a multimedia university and operational headquarters of multinationals wishing to direct their trading activities using information technology. The underlying feature of smart cities is the high level of ICT infrastructure, on which the whole city is developed. Another example of regional growth due to the information economy is Northern Virginia. Its economy has boomed with the explosion of internet and telecommunication companies. America Online, which set up in Northern Virginia in 1985, employs over 13 000 people, and generates over $1.5 billion in online revenues. The presence of a number of multinational companies such as AOL, UUNet and Worldcom MCI in the area attracts competitors as well as vendors through the normal multiplier effects. ICT Industries have well-documented, substantial effects on the local, regional and global economies through the **multiplier effect**.

The extent to which the ICT industry and associated network industries have proliferated in the economy is a recent phenomenon. However, network effects have been recognized for some time, since the onset of industrialization, but particularly with the advent of the first infrastructure industries (especially railroads) in Victorian times. Literature on network externalities dates back by almost a century to the works of Young (1913), Knight (1924), and Ellis and Fellner (1943). Contemporary research on networks tends to be econometric in nature (Shy 2001) and charts industry evolution over time in a series of snapshots. We adopt Shapiro and Varian's (1999) strategic perspective on network industries and develop a strategic framework that transcends ICT and non-ICT companies. We start this journey by analysing the structure of network industries and go on to look at the dynamics endemic in each level within that structure.

PREPRINT VERSION

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

12.2 The emergence of a new economy

In this section we look at how the old industrial economy was characterized by economies of scale and scope, while the new information economy is driven by the economics of positive feedback in network industries. We will discuss the nature of network industries, such as railroads, telecommunications, software and hardware networks. We will see how network companies benefit from positive feedback on both the demand side and supply side. On the demand side, the more customers join a network, such as a telecommunications service, the higher the incentive for other customers to join. On the supply side, the larger a network becomes in terms of users and also in size of assets deployed, the easier it is for a company to lower costs and prices. The lower the price introduced by a network company, the more subscribers will join the network and positive feedback kicks in. The result is a self-reinforcing spiral. The importance of critical mass, competition and standards is discussed in the light of the dynamics of positive feedback.

12.2.1 The old world: economies of scale and scope

The theory of strategic management was given impetus by the realization that industrial organization as a subject could be turned around to give a perspective on the entrepreneurial profit-seeking activity of firms. This led to the notion of firms seeking market power in which rents could be protected, at least for a time, by barriers to entry. These barriers were derived from the cost functions of firms, the dominant theme being the ability of firms to sustain differential cost positions through economies of scale.[2] In the world of scale economies, where minimum efficient plant sizes are a significant fraction of the market, oligopolistic market structures prevail and are overturned principally by the growth of markets or by the advance of technology enabling the creation of new assets with more advantageous cost positions. The notion of economies of scale is therefore fundamental to strategic management because it provides a rationale for firms to be different in terms of asset configuration and in terms of performance. However, this is an insufficient argument on its own for the existence of diversified firms. Diversification requires the notion of economies of scope. These are defined as 'the cost savings realized when two different products are produced within the same organization rather than at separate organizations' (Saloner *et al.* p. 364). They arise because the products share a common input such as plant or equipment, obtaining volume discounts on purchases (exercising monopsony power), or applying

---

[2] Saloner, Shepard and Podolny (2001) identify three types of entry barriers: barriers from production or distribution technology, barriers from brand name or reputation, and legal barriers (p. 138). The first two are essentially cost barriers in that replication of the incumbent's assets is inhibited by the costs of so doing. The third type is an absolute barrier that arises from institutional characteristics that are idiosyncratic from a market point of view.

common expertise or reputation. The advantages conferred by economies of scope are not, however, inherent in the jointness of production but in the barrier to entry which protects the 'original' asset. There is nothing to prevent two firms enjoying identical economies of scope if there is free competition for the underlying asset. Thus, economies of scale convey the fundamental advantage that underpins superior profitability in single-product and multiple-product firms.

The discussions in strategic management textbooks about competitive advantage are all variations upon this same theme. The simplest articulation of the theme is the cost differential that arises in production. The more complex argument concerns knowledge assets, where the essence of the argument is about the cost to reproduce knowledge and not the possession of knowledge per se. The subtlety in strategy making resides in the variety of ways in which knowledge and expertise is acquired (which is where the cost function of knowledge acquisition is important) and then captured in products and services (the generic differentiation theme). In this almost bucolic world the supply side and the market side are linked through some form of arm's-length market exchange process. Customer desires are conveyed through the pattern of their purchasing decisions and producers respond by adjusting the nature of their offerings. Where competition is monopolistic (or imperfect) producers may attempt to shape customer preferences, and to the extent they succeed, demand functions become downward sloping in the conventional manner and producers can then price according to the nature of their marginal cost curves and the price elasticities in the market. But demand and supply are mediated through a market mechanism in which product demand is independent of other products[3] and demand is not time dependent. This latter point is crucial.

12.2.2 The new world of network industries

However, there is a class of markets and industries that do not conform to these assumptions. These are known as **network industries**.[4] According to Economides and Flyer (1997):

> *The value of nearly every good is influenced by aggregate consumption levels in its market and in the markets for related goods. In many cases, high aggregate consumption in its own market, and in the markets for complementary goods affects positively the value of a good. Traditionally such effects have been called network externalities, since they were first identified in network industries. While such effects are salient in some markets, such as for telephones, fax machines and computer operating systems, for most goods these influences are more subtle and tend to be smaller.*

---

[3] This exaggerates the point, as we will see later when we discuss product complementarity.

[4] In this discussion the terms 'industry' and 'market' are used as if interchangeable.

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

Network industries are not uncommon. Many physical networks have been around for a long time, e.g. railroads, telephone, electricity. So-called virtual networks have arisen largely through information technology and include facsimile machines and computer operating systems. These are 'virtual' because the key knowledge and information assets are intangible. We can distinguish intuitively between pure networks and indirect or weak networks. Pure networks exist where it is an essential characteristic of the product that it is organized through complementary nodes and links, such as a railway network or the telephone system. A key element is the notion of complementarity, thus the value of a railway station is derived from the existence of other railway stations on the network. A weaker definition relies also on complementarity between products (or nodes, in network language) but allows the links to be created ***by*** the customer rather than ***for*** the customer. Economides and Flyer (1997) have some powerful examples:

> *the value of a washing machine is affected by the aggregate consumption of washing machines and the consumption level of the particular brand, since this determines the availability of parts, repairmen, detergents, fabric softeners and various other related goods and services. The value of a sporting event is influenced by the aggregate size of the audience, as this enhances the excitement level, analysis, discussion and remembrance of the event. Even a grapefruit is influenced by network externalities, since the variety of accessible complements, such as peeler, slicers, juicers, recipes, nutritional information and specialized spoons, are affected by the aggregate consumption of the fruit.*

The essence of this idea is that the demand for a product is influenced by total demand for the product class or by total demand in a complementary product class. Thus, demand is conditioned by a consumer externality. Where these **consumer externalities** are powerful, the feedback effect on demand is such that there is a tendency towards a single network, or platform, or standard. The value for consumers of being on a common standard outweighs any specific differences between alternative standards. We see that the VHS standard was preferred to a 'technically better' Betamax rival to the extent that the rival standard disappeared. The Wintel standard is greatly preferred to the Apple standard although the rival does still exist as a small niche in the market. Where the externality is smaller and the intrinsic difference between standards is relatively larger then we might observe multiple competing and co-existing 'platforms'.[5] An example of a platform can be seen in the automobile industry, where a company might develop a core of components and sub-assemblies that can be used to support alternative body styling to create a product range. Such a platform can co-exist with other platforms because the scale efficiencies associated with platforms is modest in relation to market size.

---

[5] To observe multiple standards defies common sense, hence the term 'platform' which denotes an array of linked complementary products that together are compatible with other products.

PREPRINT VERSION

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

12.3 Networks

What is the significance of networks and network externalities? To answer this we need to look first at what we mean by networks. Then we look at the implications for the demand function and the consequences for the market and the industry structure.

A network is a set of connections (links) between nodes. A two-way network allows the links to be operated in both directions, whereas a one-way network has distinct directionality. Two-way networks include railroads and telephone systems. Figure 12.1 shows a simple star network where A can communicate with B through a switch S. B can also communicate with A by reversing the direction of the link (viz. a telephone call). In Figure 12.1 we have eight nodes (A through H) linked through a switch, S. If this were a two-way network, AB and BA would be distinct products (different telephone calls, different rail journeys). The total number of products in the network is 56, i.e. $n(n-1)$ where n = the number of nodes. If there were to be a ninth member this would increase the total number of products to 72 (n is now 9), a total increase of 16 products available from the expanded network. If the value to each user of being in the network is proportional to the number of users then the value of this network has just increased by 28.5 per cent (16 as a percentage of 56) even though the size of the network has increased by only 12.5 per cent (one added to eight).[6] This is an algebraic characteristic of network economies of scale: that the value rises disproportionately higher than the increase in network size as long as prices are constant and products are independent. Intuitively we might expect that an increase in network size eyond a certain point has little value.[7] If this network were a one-way network there would be half the number of products but the value of the network would nevertheless increase at the same rate but achieving only half the value.

The analysis of complementarity is equivalent to the analysis of a one-way network. Figure 12.1 can be extended, as in Figure 12.2, to show a typical one-way network. Here we can interpret the A_i as ATMs[8] and the B_j as banks. The network runs only from A to B. The significance of the two switches S_A and S_B is that they have only one link. This means that there is compatibility between all ATMs and all banks. This maximizes the value of the network but increases the competition between banks for customers through ATMs.[9] It is this compatibility that makes the complementarity actual and the network operational. For complex

---

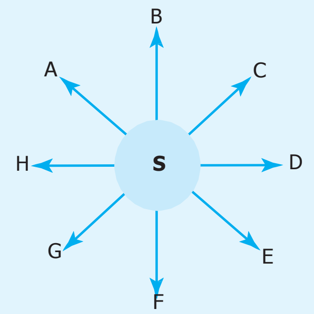
[6] Assuming for convenience in this example that prices are constant.

[7] Using calculus we would expect the first derivative to be positive but the second derivative to be negative. Therefore, total value increases but at a decreasing rate.

[8] Automatic teller machines

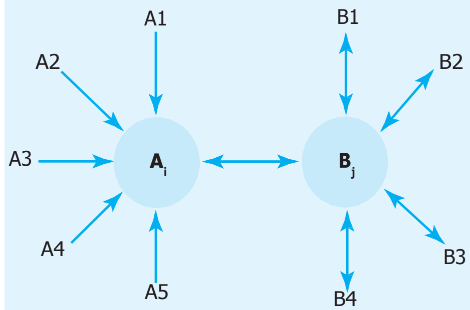
[9] Two complementary components, A and B, are compatible when they can be combined to produce a composite good. A VHS player is compatible with VHS tapes. Two substitute components A_1 and A_2 are compatible when each of them can be combined with a complementary good B to produce a composite good. Thus two VHS tapes are compatible, and two VHS players are compatible.

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.



A star network has a collection of nodes clustered around some central resource. Movement of resources/products must pass through this central node, e.g. a local telephone exchange.

Figure 12.1 A simple star network



Occurs when the central resouces are distributed among connected star networks. In a normal star network, movement can occur from any point on the network to any other point. Movement from one star to another will involve both central connections (hubs). Movement within one star will require only one – e.g. long-distance telephone network

Figure 12.2 A crystal 'one-way' network

products actual complementarity has to be achieved through adherence to specific technical standards. Other complementary products can be visualized in terms of Figure 12.2. VHS tapes could be the A_i and VHS players could be the B_j. Think also of copier paper and copiers, or printer paper and printers, or car accessories and cars, or local and long-distance telephone networks.

Case box: **Real and virtual networks**

The concept of network can be segmented into **real and virtual networks** (Shapiro and Varian 1999). Real networks are found in industries such as telephony and railways where a physical network is present. Virtual networks are typified by computer and software platforms where the interconnection between users is intangible. The two types of networks are discussed below.

In real networks the interconnection between users is tangible. Examples are cable networks for telephone users and radio transmissions in mobile phones. Electricity grids, telecommunications networks encompassing telephones, fax machines, online services and the internet are typical examples of products or services within real networks. There are one-way networks, such as broadcast television, where information flows in one direction only. In two-way networks, such as railroads and telephone systems, links are operated in both directions. Any network may be viewed as a set of connections (links) between nodes. A two-way network allows the links to be operated in both directions whereas a one-way network has specific direction. Two-way networks include railroads and telephone systems.

PREPRINT VERSION

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

In virtual networks the interconnections between users are intangible, but users remain interdependent. Computer systems are typical of virtual networks. For example, Mac users are part of the Mac network, with Apple as the sponsor of the network. Mac users are locked into a network determined by the technology standard of this platform. They can only use software that is compatible to the system and will exchange files with users within the system. Operating systems such as Windows and Unix are other examples of virtual networks. Virtual network dynamics also operate in the entertainment industry for Sony PlayStation, Microsoft Xbox and Nintendo's Gamecube networks.

Network size is still important in virtual networks in that a large consumer base makes production viable and usage possible. In addition, the value of a product increases as the number of, or the variety of, the complementary goods or services increases. Indirect network effects in the computer industry are referred to as the hardware–software paradigm. The success of an operating system for personal computers depends on the variety of software applications available in the market. Value may depend more critically on software applications.

12.3.1 Network externalities: the new economic force

Earlier in this chapter we looked at the traditional economic model for the 'old world', which was driven by economies of scale and scope. The 'new world', characterized by information and communications technology, is governed by a different dynamic. Network externalities are the new drivers of the network economy. It is important to recognize that economies of scale/scope and network externalities represent the extreme ends of a spectrum of effects, and that the presence of one does not imply the exclusion of the other. Companies may experience the effects of both to varying degrees, with a tendency for network externalities to have more strategic relevance in the new network economy.

The concept of network externalities has attracted the attention of academics and practitioners alike. The extent to which network industries have proliferated in the economy is a recent phenomenon. The effects of network externalities, however, have been recognized for some time with the development of the older network companies such as the railroads and the electricity systems. In 1804 Trevithick constructed the first practical locomotive in England. In 1882 the Edison Electric Lighting Company completed the first commercial generating station at Holborn Viaduct in London. The first commercial telephone line was installed in Boston, Massachusetts, in 1877.

Network externalities are defined as the increasing utility that a user derives from consumption of a product as the number of other users who consume the same product increases (Katz and Shapiro 1985). For example, the more people there are in a telephone network, the more users can be reached on the network, thereby increasing its usability. Fax machines, broadcast industry services, credit card networks, and computer hardware and software are examples of products exhibiting network externalities.

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

Networks were originally analysed on the assumption that each network was owned by a single firm and research concentrated on the efficient use of the network structure and on the appropriate allocation of costs (Economides 1996; Sharkey 1993). With the anti-trust cases against AT&T and its later break-up, attention shifted towards economies of scope, the efficiency gains from joint operation of complementary components of networks (Baumol *et al.* 1982). This led to issues of interconnection and compatibility in parallel with the reduced role of IBM in the 1980s and 1990s in the setting of technical standards in computer hardware and software. As technology has advanced, there have been significant reductions in telecommunications costs and a shift towards fragmented ownership of telecommunications networks. Market structure has shifted from natural monopoly to oligopoly. Similar trends are evident in other IT-intensive industries. Thus, the focus of interest in network economics has shifted from the analysis of natural monopoly towards issues of interconnection, compatibility, interoperability and co-ordination of quality.

12.3.2 Network externalities and the battle for critical mass

For normal goods, the demand curve slopes downwards. As price decreases, more of the product is demanded. Other elements in the demand function, such as income or advertising, serve as 'demand shifters' that elevate demand to a higher level. Figure 12.3 illustrates the traditional role of a demand shifter. Higher levels of consumption are derived from higher incomes (positive income elasticities) or from lower prices (negative price elasticities).

This fundamental relationship is greatly distorted in the presence of network externalities. In the presence of network externalities, we specify that sales rise as accumulated sales (the

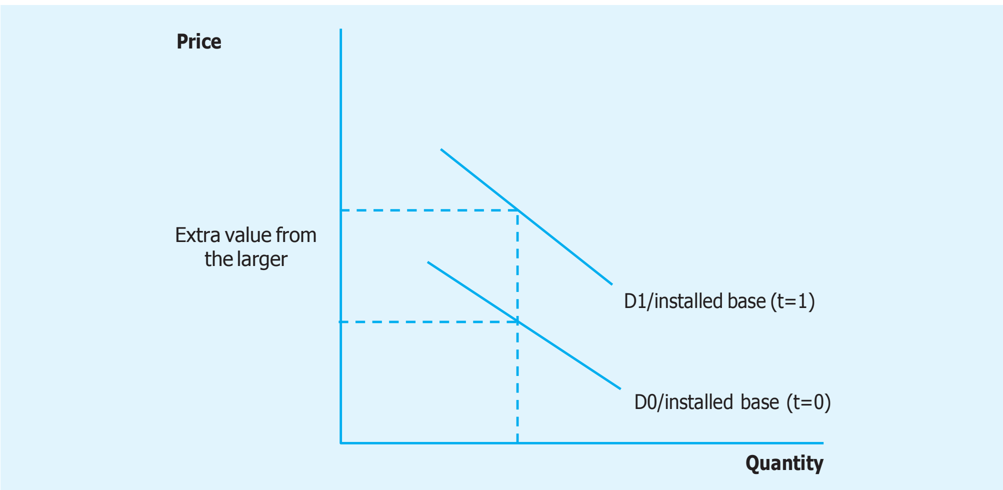


Figure 12.3 Demand shifts due to the installed base

PREPRINT VERSION

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

installed base) rise and there arises a chicken and egg problem. Customers may not be interested in purchasing because the installed base is small and/or not expected to grow. For example, imagine the purchase of complex software without internet support, help lines and user groups. Alternatively, there may be confident expectations that the installed base will grow substantially and therefore consumers will confidently make purchases. The paradox is that consumers will not buy if the installed base is too low. However, the installed base is too low because customers will not buy. The crux of the paradox lies in the management of expectations. In markets for normal goods, equilibrium is explained in terms of a balance between costs and demand, between marginal costs and marginal utility. In network markets, there is also equilibrium to be struck between actual demand and expectations of total demand.

This gives rise to an economic paradox. Almost the first law of economics is that value comes from scarcity. However, in the new economy value comes from plenty: the more something is demanded and the more it is expected to be demanded then the more valuable it becomes. Expectations are so important in driving demand that a point exists where the momentum is so overwhelming that success becomes a runaway event and we observe a 'winner takes all' phenomenon (see Figure 12.4).

The '**tipping point**' is when the installed base (or size of network) tips expectations sharply towards one player (or one network) and away from its rival. We have experienced this effect when the market moved towards Windows as the prevailing computer operating system, rather than OS2. Another example of tipping would be IBM-compatibles versus Apple, as shown in Figure 12.5. The tipping point comes somewhere in 1984 – 5 when IBM-system sales overtake those of Apple.

The exception to the winner takes all phenomenon would be a regulated network market with strong interconnections between competing platforms. The mobile telephone

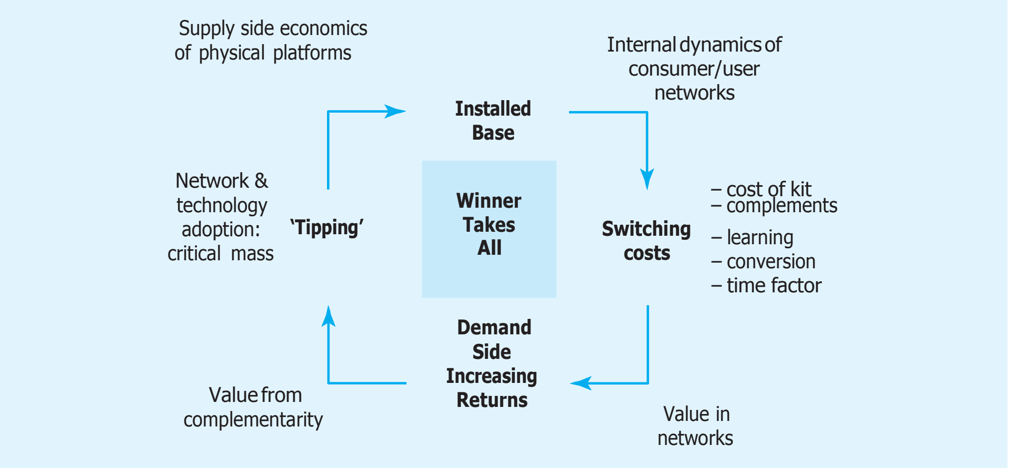


Figure 12.4 Winner takes all

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

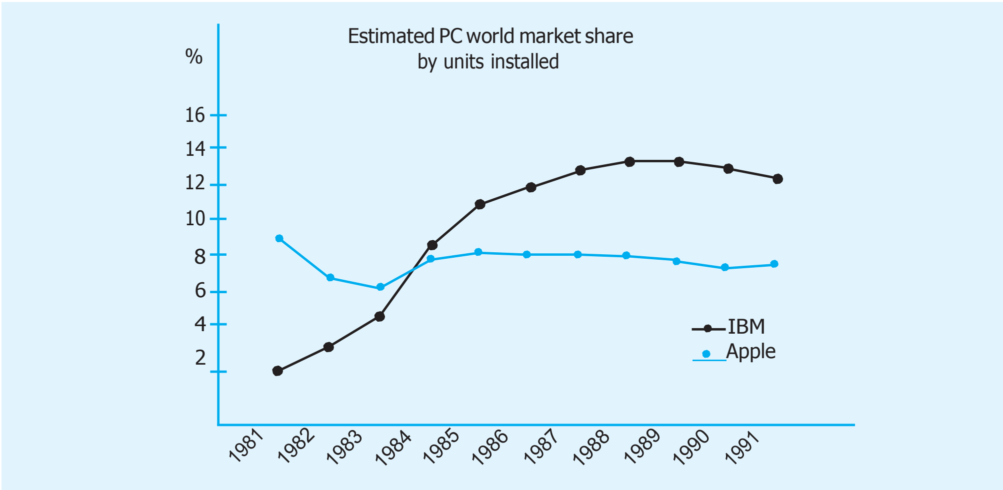


Figure 12.5 Market share of IBM and Apple

industry is a classic example. The standards are harmonized across the network providers, at least by continental region. The platforms are interlinked and the sales curves of the regulated network providers follow the pattern of the overall subscription curve for the industry.

Traditional economic thinking is based on **negative feedback systems** in which the strong get weaker at the margin and the weak get stronger, thus providing a drive towards a competitive equilibrium. This is captured in economics by the concept of diminishing marginal utility as consumption grows. In the new world of networks, feedback rules. In this world the valuation of a product increases the more that others consume the product. Strictly speaking, it arises from the interdependence of consumer decisions, whereas diminishing marginal utility dominates when consumer decisions are independent – the normal assumption in economics.

The price – quantity relationship is normally held to be downward sloping, but the demand curve for a network product should be drawn differently (Figure 12.6). The value to the consumer of a network product is reflected in the price he or she is willing to pay – the vertical axis. The principal driver of value is the size of the network, also referred to as the installed base, and is shown on the horizontal axis. Quantity demanded does still have an effect on price but for these products, this is secondary to the network effect.

The initial upward slope of the curve reflects a rising valuation at the margin, as consumers perceive that they gain value by virtue of other consumers having the product. Being on the Wintel standard gives value to new users. However, as the network grows, the extra consumers at the margin eventually become less valuable – i.e. this shape assumes that those users with higher potential valuation of the network will join first. As the network gets very

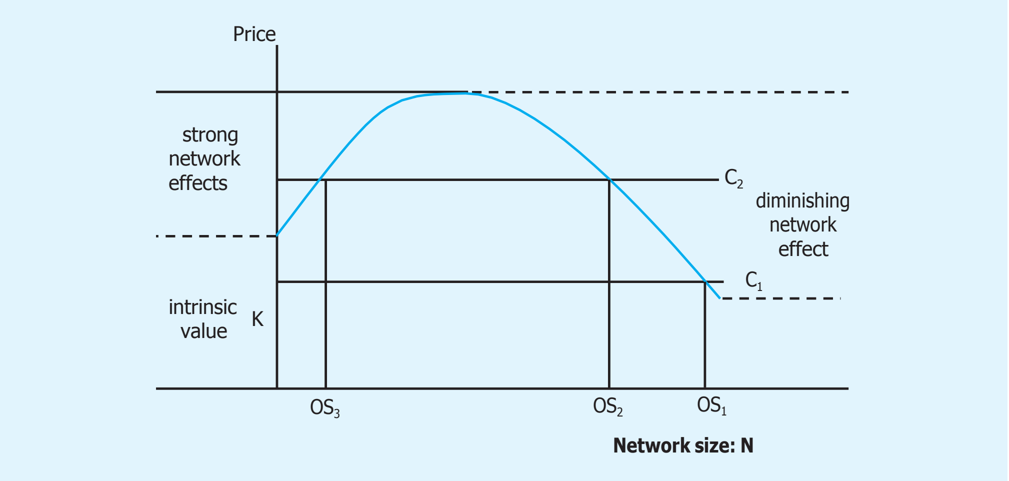


Figure 12.6 The network demand curve: the idea of optimal size

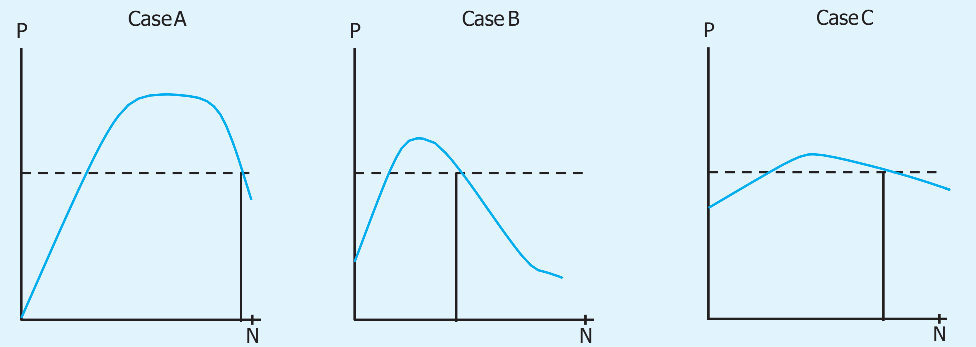
large, further growth has less value for future customers.[10] The intercept on the vertical axis represents the value the network product has as a stand-alone product. Thus a Wintel computer has some stand-alone value, but a telephone has no value on its own and is a **pure network good**.

There is a notion of an optimal size of a network. This can be seen from the interaction of demand and cost so that as less and less valuable customers join the network there may come a time when the costs of acquiring and servicing new customers begins to exceed the price those customers are willing to pay. This determines the optimal size and has significant implications for competition.

The three configurations shown in Figure 12.7 indicate the range of possibilities. The first is a pure network good, such as a telephone system, in which the optimal size of network is a very high proportion of the available market. This implies there is little or no room for rival networks. The second is a product with a significant intrinsic value that attracts a modest size group of users. For example, this could be a corporate software package (e.g. enterprise solutions) that attracts dedicated user support from the supplier through the web. Alternative networks could co-exist. The third case is one of very high intrinsic demand but extensive consumer interactions (small in size but very many in number) provide a substantial total network value. The obvious example is word processing software where the value from standardizing on MS Word is very high, with the result that alternative standards (such as WordPerfect) are being frozen out of the market even though the intrinsic value of any word processing package is high.

[10] In the language of demand curves, this is an average revenue curve.

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.



	Case A	Case B	Case C
Intrinsic value	zero	high	very high
Marginal value	very high	very high	modest
OS rel to mkt size	very high	low	high?
Pure network goods e.g. telephone/fax		high value in small networks e.g. specialized programs	normal with network benefits e.g. word processing programs

Figure 12.7 Alternative network demand configurations

12.4 The technological infrastructure of network industries

Much of the popular discussion of technology and its effects makes powerful but general claims for the effect of technology but is less than clear about the underlying mechanisms. We observe four nested levels of infrastructure within network industries. Each of these levels has its own economic dynamics and each makes a contribution to the overall network (increasing returns characteristic). These levels are (i) technology standards, (ii) the supply chain driven by such standards, (iii) the physical platforms that are the output of the supply chains and are the basis from which the company delivers its product (e.g. the digital TV, the decoder, the satellite system, and the telephone lines that are the platform from which Sky TV delivers its programmes), and (iv) the consumer network (Figure 12.8). The economic characteristics of the first three levels are the prevalence of fixed costs and joint products coupled with economies of scale. Networks of interacting and interdependent customers provide the increasing returns characteristic of networks. Then the whole can have such powerful positive feedback characteristics that the winner might be able to take all.

Each level displays distinctive economic characteristics of significance. Technology standards can be achieved either by rule or by emergence and in the latter case early mover advantages are important. The economics of modularity and the specialization of knowledge shape the structure of supply chains. Physical platforms are a melding of standards and components in which modularity and the economics of substitution also play a

	Language of networks	Wintel	WWW	Mobile phones	Satellite TV
Network externalities, consumer lock-in, market equilibrium and tipping	Consumer network	PC producers, retailers, offices and homes	PC producers, retailers, offices and homes	Individual corporations	Households
Economies of scale, critical mass, positive feedback, externalities, path dependence	Physical platform	PC producers, retailers, offices and homes	Global net of millions of computers, ISPs, online services, software	Mobile phones, transmitters, land lines, BT phones	Satellite transponder, decoder, TV shopping signal via phone
Supply-side economics, economics of substitution, versioning, switching costs	Technology standards	Win95 runs on x86 only. WinNT runs on non-x86 chips. Linux runs on x86	HTML IP, TCP/IP, VoIP	3G, 2.5G, GSM, GPRS, UMTS	Proprietary decoder vs CPSI
Technical capabilities ahead of markets: R&D races, JVs and alliances	R&D supply chain	New 'itanium' chip is being held back to preserve current version	Integration of internet with cable TV: Microsoft Mobile Internet	I-mode technology by DoCoMo	IoS – Internet over Satellite Currently for ISPs

Figure 12.8 Strategic levels of network industries

significant role. Consumer networks, of course, require positive feedback effects for their full power to be gained. We use the mobile telecommunications business as a running example to show how these technological dimensions and strategy interact.

12.4.1 Technology and standards

The significance of the economics of information is attributed to two key factors: the continuing reduction in cost of information technology hardware products and the scale effect of global standards. Gordon Moore, founder of Intel Corporation, created a corporate empire on his eponymous Moore's Law, which states that every year and a half processing power doubles while costs hold constant. Moore's foresight proved prophetic and 'Moore's Law' is expected to remain valid for the foreseeable future (but *see* Leyden 1997). Computer memory, storage capacity and telecommunications bandwidth are all going through a similar pattern of cost reduction. This makes it very affordable for individuals and small businesses to be equipped with the electronic means to conduct commerce and transfer information as fast and freely as large corporations can. Hence, the demand for the products of the ICT industries continues to grow.[11]

[11] In spite of the feast and famine evident in the telecommunications industry reminiscent of the fragility of corporate structures during the railway boom of the 1840s.

However, the rapid growth of products from the ICT economy depends on operating technology standards as well as on production costs. For example, automated teller machines across the world must work on an agreed standard to ensure customers can use one card in different countries. A technology standard is the important enabler to create wide reach and to capture a wide network of subscribers. With the globalization of commerce, national and regional boundaries blur and the need for international standards is more urgent and critical.

A new **standard** can be registered with organizations such as the British Standards Institute, the American National Standards Institute or the International Standards Organization. But the process to determine the prevailing standard does not stop there. The path to achieving a de facto standard stems from three modes of selection process: market-based selection, negotiated selection and a hybrid selection process where both market competition and negotiation operate jointly.

Market-based selection is reflected in standards wars such as that between VHS and Betamax, where consumers decided on the dominance of the VHS standard. The marketing strategies of firms are key to which firm and standard is most likely to win. VHS gained a decisive advantage from a strategy of wider distribution channels and a range of complementary products (Hollywood films) as well as longer recording time than Betamax, in spite of other more advanced features available only on Betamax.

Negotiated standardization is becoming more widespread. Organizations that determine prevailing standards are emerging to reduce the cost and the uncertainty associated with adopting new standards. Negotiated standard setting guarantees the smooth interchange of information, technical components and services along different networks. The telecommunications industry was able to keep up with the speed of technological development by opening up the negotiation process to market players (David and Steinmueller 1994; David and Shurmer 1996). Groupe Speciale Mobile (GSM), the current mobile technology in Europe, is an association of 600 network operators and suppliers of the mobile phone industry. The UMTS Forum is a similar association, developed to speed convergence between telecommunications, IT, media and content suppliers for the 3G industry. As with GSM the name of the UMTS association is synonymous with the name for the industry technology standard.

The internet has a different history of standardization to telecommunications. Standards were completely open and established within the research communities of universities. As the internet has become a commodity for the domestic and the commercial communities, other players are increasingly influencing its evolution.

Hybrid standard setting emerges as private firms adopt strategies to undercut collaborative decisions taken in negotiated standardization. They introduce new products, which initiate unprecedented developments but also create incompatibilities, lock-in effects, and pockets of market power. Internet telephony is a typical example, where companies, standards organizations and governments create a hybrid standard setting environment (Vercoulen and Wegberg 1998).

Case box: **Standards versioning**

Standards organizations are playing an increasingly important role in the process of upgrading standards (called '**versioning**'). The GSM Association is guiding the evolution of the mobile industry through a family of wireless technology standards from today's standard through to GPRS, EDGE and 3GSM. Each subsequent standard offers a higher level of service. GPRS provides open internet. EDGE facilitates faster data streaming, and 3GSM will provide video streaming. The network of companies supporting the technologies will go through grades of service levels in order to phase out older standards and introduce new ones (Figure 12.9). At the end of the life span of a standard the **technology platform** is decommissioned, with the exception of equipment and software that is forward compatible with the next generation of standards.

Software standards follow a similar versioning strategy. Microsoft publishes the *Windows Desktop Product Lifecycle Guidelines* to provide advanced notice of changes in product availability and support. Microsoft makes Windows licenses available for purchase for a minimum of five years and provides assisted support for a further four years. The guidelines are important so that companies can plan their investment through software upgrades of Windows 98, NT, 2000, ME, and the latest version of Windows XP.

Switching costs are minimized when standards are designed to evolve from one another. The introduction of revolutionary standards, however, is costly. The pay-off is superior performance against the high cost of switching standards. The telling example is the price paid by mobile telephone operators to switch to third-generation technology. Mobile spectrum auctions earned European Governments £200 billion with Britain and Germany raising £22.5 and £60 billion respectively. The mobile operators had to bid – to renounce third-generation spectrum was to opt out of the future (but did they have to pay so much?). The outcome of these auctions left mobile operators with increased debt, depleted cash flow, and delay in third-generation launches, all of which became the more significant as the stock market faltered and then stopped dead.

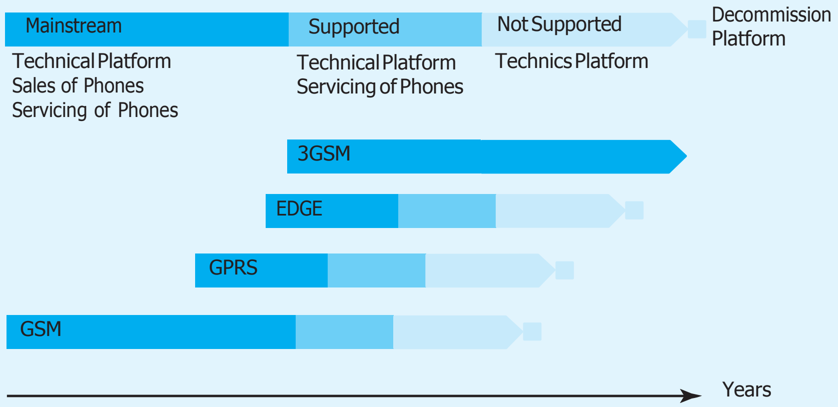


Figure 12.9 Standards versioning in the mobile telecommunications industry

12.4.2 Supply chain

In the last twenty years, the structure of the information economy has evolved through the interaction of three factors: the increase in computational capacity for data mining; the growth of telecommunication networks both fixed and mobile; and the explosion of information sharing via the internet.

These new, powerful characteristics of information have created opportunities for all industries, including network industries, to take advantage of new ways of managing supply chains. How to integrate company functions became the key concern and enterprise resource planning (ERP) systems provided the solution. Integration of the elements of the supply chain was seen as a move to dilute the boundaries of the rigid corporate departmental structures that were restricting business growth. The ERP era was the first wave of change in supply chain management. Deconstruction policies soon followed. Based on the example set by the automotive industry, many companies split their business processes and pushed some of them out to suppliers. Companies would retain the processes they liked and outsource the remainder. The elements of the supply chain would then be controlled through proprietary resources, which are difficult to replicate, such as a strong brand identity. MMO2, the UK mobile network provider that has recently faced upheaval is deconstructing its value chain as a means of strengthening its position (Pesola 2002). The company will move all its IT systems, including such functions as customer care, e-payments and billing to IBM. The outsourcing agreement covers ten years and is worth £50m in its first year. MMO2' s tactics are an interesting pointer of how the European mobile industry is changing its operating model in order to emulate the US model.

With the outsourcing of functions and the need for specialist knowledge in handling electronic transactions, the number of organizations involved in the supply chain is increasing. As a result of integration and deconstruction, suppliers are developing modular structures with Lego-like snap-together interconnectivity. The complexity of the new supply chain structure is becoming akin to a business ecosystem of networked co-operation, rather than the traditional chain of competing suppliers, manufacturers and distributors (*see* Mathews 2002).

Figure 12.10 depicts the modular structure of the ICT industries, which constitute the new information economy. The structure is built on layers of communication network companies, hardware and software manufacturers, internet service providers, e-commerce transaction companies, media and content companies, and myriad service companies.

The network infrastructure suppliers are companies such as Alcatel, Nortel Networks, Motorola and Ericsson that provide communications networking equipment. Intel and 3Com form a sub-set of companies in this category, which supply interfacing hardware and software.

The network operators provide the basis of the exchange of information between companies and their customers. The medium they operate could be based on satellite, telephone, mobile, television or area networks. British Telecom, AT&T, Vodafone and T-Mobile

PREPRINT VERSION

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

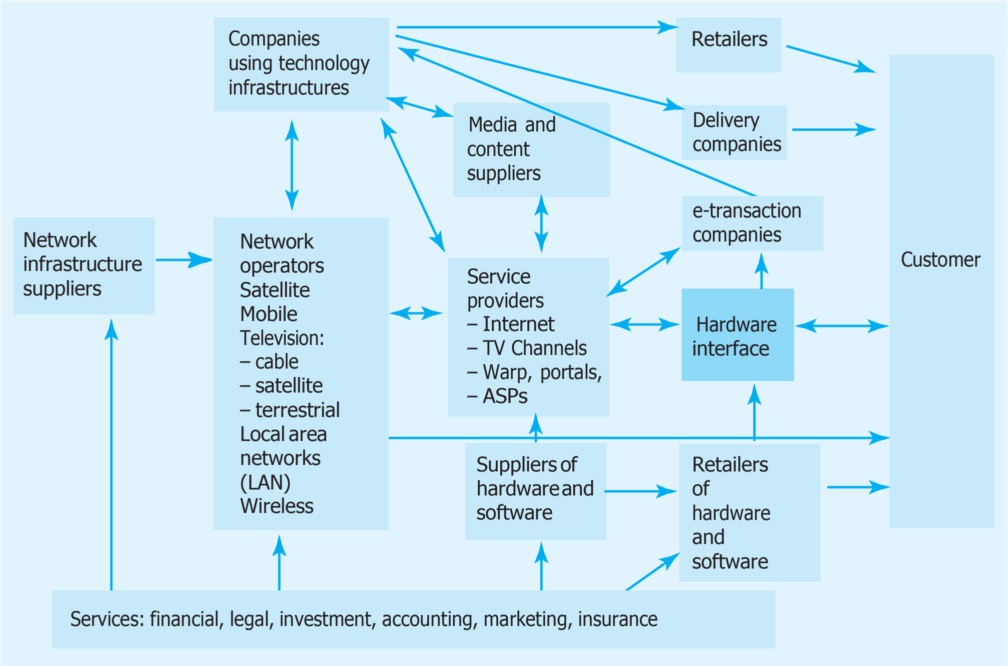


Figure 12.10 The modular infrastructure of the ICT economy

offer landline and mobile telecommunications networks. The operation of these companies is interconnected with other companies. For example, Vodafone uses BT' s network. Credit card companies use Vodafone' s mobile network for off-site credit verification. Vodafone has sold fixed-line telephone services from Energis and Racal Telecom networks. The interoperability of different telecom networks has become a complex business operation. British Telecom set up BT to develop and manage such relationships. BT Wholesale sells its fixed network product to independent service providers: businesses that wish to provide telecom services to end consumers without owning their own networks. The independent SP purchases the network facility from BT and other network operators, adding their own value and service brand.

Satellite networks provide the infrastructure for long-distance television, telephony and data interchange transmission. SES GLOBAL, Gilat Satellite Networks and Alcatel Space/SkyBridge have formed a □200 million joint venture to provide two-way satellite broadband services in corporate and home office markets across Europe. The new company plans to cater for the growing demand for broadband communications services in Europe via advanced VSAT satellite technology.

Digital television networks operate on a host of platforms such as satellite, copper or optic fibre cable. Interactive television has opened a host of business opportunities for retailing. The use of two-way cable networks, or a return medium via a normal telephone line, is changing the way consumers use and respond to television content. The business model for this service implies a new form of supply chain, for a new form of retailing.

Internet service providers are part of a complex web that provides the supply chain of information to the internet user. ISPs such as AOL and Fastnet convey internet content over the infrastructure of the telecommunication companies. At the back-end of the supply web, ISPs receive web pages from various organizations. The owners of the web pages would be the media and content suppliers, or, in many cases, they may have purchased the services of the media and content suppliers to create their web presence. At the front-end, where the supply web touches the customer, ISPs have to collaborate or conform to consumer interface manufacturers, which in the internet scenario would be computer suppliers. The supply web for the internet is due for another major revolution with third-generation (3G) mobile communication, which carries high-speed internet and video streaming. The 3G telephone, which will become the new customer interface, could dictate a change in internet transmission management and the nature of media content all the way down the supply chain.

The supply chain in the information economy shown in Figure 12.10 takes the form of a weblike network where each member may have to collaborate with many other members. Intercollaboration is possible because of software and hardware compatibility, and necessary because of the high degree of knowledge specialization at each point on the supply chain. An example of this weblike structure is the relationship between e-transaction companies, ISPs and media content providers and the companies that own the web pages. The four types of organization have to ensure the compatibility of their services across the supply network.

The infrastructure of the information economy does not look like a normal, traditional and competitive supply chain in the 'old' industrial economy. Telephony and the internet have made it possible for corporations to have commercial partnerships with many more companies. The notion of 'information is power' is turned on its head. As more companies have access to more information through communication, power is dissipated to more members in the supply chain. This increase in information exchange has become the overriding equalizer of power throughout the supply networks.

The basis of this new economy is the increase in connectivity among the various players in the chain. The connectivity level itself is rapidly evolving as communication and computational technologies become faster. The whole supply network is in a state of flux. Flexibility and adaptability have become essential strategic stances. Faster connectivity within the supply chain not only implies more interconnections between companies, but it also creates more volatile and replaceable interrelationships.

The concept of replaceable interrelationships has come about because companies are becoming '**isomorphic**' or similar in nature. DiMaggio and Powell (1983, p. 149), drawing from Hawley (1968), define isomorphism as 'a constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions'. With the standardization of technology, products are becoming more similar in design and

PREPRINT VERSION

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

quality. With the standardization of internal operations, through materials resource planning (MRP), enterprise resource planning (ERP) and electronic customer relationship management (eCRM), the service levels of competing companies are becoming similar in content and in construction. The implication is that suppliers are easily replaced with similar companies that have similar products and similar delivery attributes.

The information economy is creating a web of companies that have lower barriers of entry but fewer safety nets for retaining business. The older, hierarchical value chains of the industrial economy reinforced exclusivity, while the information economy is more inclusive.

Case box: **The rise of co-evolution and co-operation**

The new weblike value chain gives rise to a 'self-organizing' system. In nature, flocking is a form of self-organization. The formation of flocking birds is a self-organizing form of collaboration, with simple goals of direction and velocity. Similarly, companies organize and adapt their relationships with vendors and distributors. They select and substitute their partners in the value chain according to changes in the consumer market. Vendors and distributors in turn adapt to new market scenarios. For example, a wave of collaborative buying (when competitors join forces for purchasing) is counteracted by a wave of collaborative vending from vendors. The system eventually normalizes the balance of power.

The 'self-organizing' aspect in the information economy leads to the concept of 'co-evolution' (*see* Kelly, 1994, for an overview of the implications of adaptive behaviour). Evolving to meet the needs of other members in the value chain is becoming a more effective strategy than satisfying the company's own needs. Adapting to meet other companies' need leads to more business. Riding the new wave of co-evolution, companies are avoiding costly races against each other in favour of a strategy to join forces to gain more customers. We are observing this effect in NEC and Siemens, which have joined forces to supply the networks for Hutchison 3G, a key network provider of third-generation telecommunications in Europe.

Co-evolution and collaboration are even more relevant in industries where network externalities are a vital part of corporate success. The more customers join a network, such as a telecommunications service, the higher is the incentive for other customers to join. This effect is causing companies to collaborate on issues of compatibility. With 3G mobile phones on the horizon for Europe and the US, the standards war for a mobile internet operating system has begun. Microsoft, Linux, Symbian and Openwave are in the race to establish a widely accepted standard. This is an example of old-style competition, but it has caused a wave of co-evolution in another layer of competitors. The issue of standards has motivated Nokia and Siemens, Europe's largest manufacturers of mobile phones, to collaborate. They have teamed up to accelerate the introduction of third-generation mobile services. The collaboration of two companies will guarantee that Nokia and Siemens handsets can communicate with each other seamlessly. In this way the two companies, which have a combined global market share of 45 per cent, will benefit from network externalities and the positive feedback generated from providing a larger compatible technology network. Nokia and Siemens anticipate that other equipment vendors will link up with them to minimize industry fragmentation.

PREPRINT VERSION

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

12.4.3 Physical platforms

A **physical platform** is the tangible infrastructure (such as computers, telephones, satellites, digital TV and local area networks) that delivers a service to consumers. A simple example of a platform is the PC on your desk. This comprises a set of hardware and software items joined together to provide a computing service. The component items are built according to to explicit technology standards and are delivered through separate but parallel supply chains to the PC assembler. Similarly, to obtain Sky' s pay-TV service one needs a physical platform consisting of digital TV receiver, set-top decoder, telephone landlines, satellites and ground stations. The physical platform is an assembly of items, each constructed to specific standards and integrated to deliver service to the customer.

Case box: **Globalstar**

Globalstar is another example of a physical platform. Globalstar provides mobile telecommunications using Low Earth Orbiting (LEO) satellites. Its telephones look like mobile or fixed phones but the difference is that they can operate in areas outside normal reach. The satellite platform picks up signals from the Earth's surface, and relays them to the terrestrial gateway. Gateways distribute the calls to existing fixed and mobile networks. Terrestrial gateways are vital to integrate the company's services with existing local telephony networks.

The size of a physical network does not guarantee success. Iridium had a larger physical platform of satellites than Globalstar, but faced marketing-related difficulties at start-up. When it launched in 1998 it targeted the consumer users, who rejected the service because of its cost and bulky first-generation phones. Iridium filed for bankruptcy in 2001 and planned to decommission its satellite platform. It was purchased by a consortium, which paid $25 million for the inactive satellite system, which cost $5 billion when it was built in 1998. Iridium has recuperated most of its losses by changing its marketing segmentation strategy. Its current major user is the US Department of Defence, which is in line with its sales strategy to service large industrial users in remote locations (Weiss 2001).

Physical platforms have evolved from the simple structures, such as the older regional railway system, to a complex structure of interconnected sub-platforms. For this reason, the joints between the sub-networks become the strength of the whole structure, or, conversely, it could be its Achilles heel. It is therefore vital to define standards for joints. The standards that govern how a system and its modules interact is called the network' s architecture (Morris and Ferguson 1993).

Henderson and Clark (1990) review two kinds of dynamic processes in modular systems: **modular innovation** and **architectural innovation**. The former type retains the architecture of the network, including its joints, but modifies the modules. By preserving the basic

PREPRINT VERSION

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

architecture of a system, network providers offer users enough compatibility to shift from one product generation to the next. The changes occur in the innovations and improvements of the modular components. They are be fitted into the system when required, and will be removed when obsolete. The result is a hybrid dynamic of change that preserved the platform's architecture while creating innovations within the module structure. A series of minor incremental modular changes can lead to an overall network platform that is radically new (Vercoulen and Wegberg 1998).

In architectural innovation, the modules are largely unchanged, but the architecture that connects them (the jointing system) is changed (Henderson and Clark 1990). The speed of innovation can be fast, as a key part of the system, the modular structure, is retained. New joints between these modules are installed. In some cases, adopting new standards and installing some new modules that embody these standards create an architectural innovation. The development of the internet in the late 1990s is an example of an architectural innovation in a network platform. The main proponents of the internet evolution are standard-setting bodies such as the World Wide Web Consortium and the Internet Engineering Task Force (Vercoulen and Wegberg 1998).

Case box: **Managing interoperability**

Physical platforms in the telecommunications industry are typically open platforms (like Wintel is for PCs) that provide interconnectivity with other telecom networks to add value and create network externalities. Open platforms have stipulated protocols, which are implemented by a large user base, as in the case of IBM clones. Closed platforms or proprietary platforms make it difficult for others to interact properly with those systems. Microsoft software and Apple computers are examples of closed platforms.

Open networks require interconnections and compatibility with surrounding networks. Telecommunications platforms have had to cope with the complexity of interoperability among different systems, as well as the agility required to shift rapidly to newer standards. The dynamics of complexity and agility used to be opposing forces (Vercoulen and Wegberg 1998). A complex interconnected physical platform tends to develop slowly. Railway systems and the telecom networks in many countries show this inertia. Communications and technology firms progressively created a solution to these opposing dynamics of development. As in the supply chain case discussed earlier, companies divided their platform structure into separate modules, each with some degree of autonomy (Langlois and Robertson 1992; Garud, Kumaraswamy and Prabhu 1995). Each module is designed with the flexibility for rapid change, such as the shift from ETACS to GSM. The complexity feature is retained because each module is interoperable with other modules to form a weblike complex system. The modules are therefore interdependent through the nodes, or joints between the modules. Interoperability between modules creates value for the user, as we observe in the ability to call overseas on a mobile telephone. Roaming of mobile telephones from country to country is another example. Interoperability exists between platforms of different network providers in the same country, or different platforms in different countries.

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

Building alliances

The reach of a technical platform determines the size of the consumer base. For this reason, companies are building alliances to gain the rewards of positive feedback. Apple and Microsoft have collaborated to create a version of Office that operates on an Apple computer. The effect is to allow the Apple computer platform to overlap with the Microsoft Office platform. In the mobile industry, competing telephone manufacturers are clamouring to create a communications platform with a common operating system. Ericsson and Nokia use the Symbian operating system on their third-generation mobile phones. Panasonic and Motorola are planning to introduce telephones with the software platform. Symbian will receive a total of $17.95 million in funding from Nokia Corp., Motorola Inc., Panasonic, Sony Ericsson and Psion to support its development (Evers 2002).

The Ethernet is an earlier example of alliance formation intended to increase the size of a physical platform. In 1973 Metcalfe and Boggs invented the Ethernet, the local area networking (LAN) technology that acts as a means to send vast amounts of data at high speed to the laser printers that Xerox was designing. Interestingly, the Ethernet came before the PC, yet it was to create a breakthrough in computer networking that would eventually tie together over 50 million PCs worldwide. The Ethernet quickly attracted Digital and Intel's interest to adopt the communication platform. Metcalfe had moved on to form 3Com but remained the key player in the discussions between Xerox, Digital and Intel. The DI3X group was formed, named after the first letter of the company names. The alliance lobbied for Ethernet to become a standard approved by the IEEE. Xerox agreed to license Ethernet to all users at a nominal fee of $1000. It realized that it would have to provide an open standard to get computer manufacturers to take on Ethernet as an interface to their printers. The strength of Ethernet was that it allowed PCs and workstations from different manufacturers to communicate by using an agreed standard, hence increasing the size of its physical platform and therefore its reach.

12.4.4 Consumer networks

A **consumer network** requires interdependencies between consumers. In a consumer market there are two levels of value attached to a product. 'Autarky' value (Liebowitz and Margolis 1999) refers to the value associated with a product irrespective of the number of other users. In marketing terms, this would be the 'core' value of a product. In economics this is the normal assumption and the theory of the firm is based on assumptions about the independence of individual consumer preferences. 'Synchronization' value is the augmented value derived from being able to interact with other consumers. The latter fuels the dynamics of the network effect discussed earlier in this chapter and in McGee and Sammut-Bonnici (2002). For example, the relative abilities of Microsoft, Symbian or other companies to capture synchronization value will determine who will gain critical mass first and win the race to establish the new operating system for third-generation mobile telephones. Customers will buy the 3G phones with the operating system they expect to be the most popular in the future. In this way they will be able to communicate and exchange video clips and photos with the widest possible set of users. The success of the winning operating system might depend on the psychology of consumer choice, or it could depend on technology characteristics from supply chain strategies and technology standards. For example, Microsoft and Intel co-operated to make Windows 95 exclusively compatible with Intel x86 microprocessor architectures and vice versa. The media coined the effect the 'Wintel Advantage'. In the case of mobile operating systems, Symbian and Microsoft are rallying their respective set of supporters to establish separate supply networks.

Lock-in and switching costs

The Wintel case led to a situation of **lock-in** for Windows users. The Wintel operating system quickly gained critical mass through rapid adoption and it became the most popular system throughout the world. On top of this, Windows users then invested in complementary software such as the Microsoft Office suite. Lock-in arises whenever users invest in the multiple complementary and durable assets of a physical platform and then find the costs of switching to an alternative to be prohibitive. Lock-in can occur on an individual level, company level and even a societal level. Thus, individuals may face switching costs in adopting a rival to Microsoft software, but so also do companies in having to provide systematic retraining costs, and so might whole communities in having to move from one software product to another. The key is that it would usually be necessary to switch from one dominant product to retain the interdependencies and complementarities between consumers. Private users were locked into the long-playing record technology because records could not be used on CD players (but were persuaded to switch when the benefit – cost ratio of the new products became sufficiently large). Note that the benefits of tape recording were never large enough to persuade customers to make a wholesale switch from LPs but the extra benefits of tapes (ability to record) were sufficient to persuade customers to invest in parallel systems. Companies became locked into Lotus 1-2-3 spreadsheets because their employees were trained in using the program command structure but later were persuaded to switch to Excel within Microsoft Office because of the extra complementarities. On a societal level, millions of users throughout the world are locked into using Microsoft's Windows desktop operating environment, as it has become the standard software in offices around the world.

Case box: **Lock-in and switching costs in mobile communications**

Telecommunication systems providers have chosen to offer new, superior technologies despite high switching costs. The industry has undergone three generations of technologies – TACS, ETACS, and GSM – and is now in the early days of introduction of 3G, incurring significant investment costs. Their calculation is made on the basis that the new systems will provide backward compatibility plus the expected benefits of new services.

Switching costs and lock-in at the consumer level can be deliberately used to inhibit or prevent consumers from adopting newer technologies or moving to alternative networks. In mobile communications, users may switch to another network provider with the same technology but with a different price structure. They may choose to switch to another technology when they replace their handsets with higher-level models. The strategies of the mobile telecommunication companies have focused on manipulating the tangible and intangible consumer costs when switching networks. In the introductory phase customers were contractually bound to a network for a year. They had to pay a release fee to end the contract and a connection charge to go to the next network. In the later 1990s switching networks became easier with the introduction of pay-as-you-go cards. But the hidden, intangible costs of switching remains, irrespective of payment structures and Oftel's recent pressure to minimize switching cost in the industry. Customers are deterred from switching by the investment in the time required to get used to a new product and are further inhibited by the uncertainty about the quality of untested products. The influence of brand loyalty is also significant. To the consumer, another very relevant switching cost is the loss of the mobile number when moving to another network (this was also a very big issue in the development of the telephone system in the USA over a century ago). Subscribers' reluctance to give up their familiar numbers resulted in the introduction of subsidized phones and more competitive tariffs. The power of switching costs can be observed in the entry strategies against powerful incumbents. Vodafone and Cellnet started to operate in 1984 and had a captive customer base by the time Orange and One2One entered the market in 1993 and 1994 respectively. The new entrants had to generate new customer-winning strategies with stronger branding and lower costs.

On a societal level economists observe that the practice of using lock-in strategies can have negative welfare effects as new superior technologies are suppressed. Liebowitz and Margolis (1990) discuss the fascinating example of typewriter keyboard layouts. In the 1870s the QWERTY configuration was selected by the creators of the TypeWriter brand in order to slow down typists in order to reduce jamming of the keys. The Dvorak layout patented in the 1932 is a more efficient layout and allows faster typing. This would suggest that QWERTY should then give way to the more efficient keyboard layout. The phenomenon of sticking to the slower QWERTY system is explained in terms of switching costs.

PREPRINT VERSION

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

The collective switching costs are far higher than the individual switching costs because the co-ordination for mass switching to Dvorak is so difficult. With the advent of electric typewriters if the 1950s and then computer keyboards the expectation is even stronger but QWERTY still remains.

12.5 Networks, standards and competition

According to Economides and Flyer (1997):

> *Firms that compete in markets where network externalities are present face unique trade-offs regarding the choice of a technical standard. Adhering to a leading compatibility standard allows a firm's product to capture the value added by a large network. However, simultaneously the firm loses direct control over the market supply of the good and faces (direct) intra-platform competition. Alternatively, adhering to a unique standard allows the firm to face less or no intra-platform competition, but it sacrifices the added value associated with a large network.*

This trade-off is a key strategic decision that depends in part on the control that firms have in making their output compatible with competitors' outputs and complementary products. The ability to conform to a common standard opens the opportunity to make this trade-off. Where standards are proprietary, the decision rests with the owner of the standard. The owner's trade-off is the pay-off associated with developing the existing network and its spillovers versus the introduction of more intra-platform competition. Essentially the trade-off is the same: to adhere to a common standard or to seek uniqueness. This can be expressed as a sequential game: at the outset, one chooses the appropriate technical standard (and, therefore, the network to join), and later one chooses how to compete. Normal markets do not have this choice of network and there are consequences for market structure and competition in the presence of network externalities. The mathematical model in Economides and Flyer (1997) defines networks as coalition structures and analyses the stability of coalitions under different standards regimes and varying levels of network externalities. There are a number of implications for market structure in the presence of network externalities.

First, it is intuitively clear that industry output will be higher when there are network externalities and when standards are open. Firms are free to choose which standard to adopt and are deterred only by the costs of adoption. Second, when standards are incompatible and the owners of standards can exercise proprietary control, incumbents are more strongly protected against the consequences of new entrants. Moreover, there will usually be considerable asymmetries between firms in terms of outputs, prices and profits. (Under incompatibility regimes, firms are equivalent to platforms and constitute one-firm networks.) For pure network goods the asymmetries are particularly marked.

PREPRINT VERSION

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

In general, with total incompatibility of standards market concentration, output inequality and price and profit inequality increase with the extent of the network externality. This is an important result because it explains why one or two firms so often dominate network industries. The mechanism is straightforward. The leading network establishes its critical mass, leaving the second network to establish a critical mass across the remaining untapped market coverage. The third network follows in the same fashion and so on. It follows that there will be a tendency to provide large incentives to organize customers into few platforms so as to maximize the added value from the available networks. Firms will be keen to abandon their own weak standards in favour of the higher value obtainable from a leading network.

There is a third implication. Where there are proprietary standards and strong network effects, there is no natural equilibrium in terms of network offerings. There are always incentives for at least one firm to move to a stronger network and the consequence of any one move is to shift the incentives for all other firms. However, equilibrium can be reinforced by the refusal of firms to make their proprietary standards available. Again, the mechanism is straightforward. Under strong externalities, the owner of a standard has a considerable incentive to exploit the standard by itself and to exclude other firms with weaker standards. Conversely, where the externality is weak, the owner will find a stronger incentive to admit other firms to its proprietary standard in order to grow the network through collective effort and thus generate more added value.

In summary, strong network externalities suggest the following conclusions:

1. Larger industry output.
2. Very large asymmetries between firms/platforms.
3. Likelihood of market dominance.
4. Enhancement and protection of proprietary standards.
5. Equilibrium market structures that are the reverse of the world without network externalities.

12.6 Implications for strategy

This chapter argues that there are major differences between the economic and strategic characteristics of the **new economy** compared to the old industrial order. These major differences can be summarized as follows:

1. The information economy depends on connectivity. Without connectivity, consumer interdependence is indirect. Positive feedback gives an economic law of plenty – more gives more.
2. Upfront costs are very large and revenues can be substantially delayed and are

PREPRINT VERSION

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

significantly at risk. As a result, the nature of business models is different, with higher degrees of risk embedded in them.

3 It is also a world of immense uncertainty where even the range of potential outcomes is not known, but also where there is a significant probability that future technological change might undermine an apparently winning position.

4 The competition between rival networks/standards can be hard to call in advance.

5 'Tippy markets' substantially raise the level of risk.

In this new world there is much more uncertainty and companies need to take bigger risks in order just to survive. The prospect of entrepreneurial profits is enticingly large but there are probably greater probabilities of failure. The list of failures and near failures in the last decade by large companies is very long. There are some new strategic 'rules' for competing in the new economy. While these are quite generic in nature they illustrate that companies need to come to these markets with a different mindset about how to compete:

1 **Expectations management** is central to the way in which marketing strategy is conceived (see the case box below).

2 **Open standards** are the key to volume. Protected standards are only viable as small high-priced niche markets. The old preoccupation with protection of intellectual property is giving way to a sharing and co-operating approach.

3 There is a law of inverse pricing. The best (i.e. the most valuable in the future) products are given away, such as web browsers, in order to create a consumer standard, and sheer volume causes both marginal costs and prices to fall over time as the product becomes more valuable. The cash flow machine consists of modest (even small) margins multiplied by gigantic volumes to defray massive investments. The machine is volume driven and protected by very large switching costs.

4 The first strategic choice is which network to join (which standard to adopt). The second, and a long way behind, is how to compete within the network of choice.

5 Networked complementarities and co-operative strategies are replacing the old order of hierarchical business organization and competition.

6 In a world of uncertainty, customers are also uncertain about which standards, technologies and products will prevail. This will increase the power of brands and place upon marketing the need to manage customer expectations so as to speed adoption rates towards tipping points in the market.

The economic characteristics of network industries are dependent in large part on the interconnectivity that is characteristic of the technologies of information goods. Interconnectivity allows customers to view, use and link products, giving rise to virtual networks of customers. In these networks, powerful demand-side increasing returns

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

can operate. Where consumer-based externalities are powerful there are strong pressures towards 'winner takes all' phenomena (e.g. Wintel globally, and Sky TV in the UK). In these circumstances conventional economic laws are challenged. De facto monopoly can emerge: but uncertainty is high and markets may be intrinsically unstable. Successive waves of technology may outmode old monopolies and serve as the basis for new monopolies.

The rate of growth and now the sheer size of the ICT industry has been the progenitor of major changes in the economy. We have seen major effects on other industries through the new value possibilities that information technology offers and through the substantial fixed costs and minimum scales required for effective deployment of these technologies. When linked to networks of interdependent customers we see the potential emergence of 'winner takes all' strategies and the emergence of new monopolies.

We have decomposed the ICT industry into its component parts in order to see who the players are and how they interact with one another. In doing this we argue that we are beginning to see a new type of industrial order – one marked by networked complementarities and co-operation in place of the traditional model of hierarchy and competition. We have also decomposed the industry into four horizontal levels – technology, supply chain, platform, and network – to show that these have different economic characteristics and therefore that corporate strategies have different dynamics. The examples quoted indicate the range and extent of the possibilities inherent in the new technologies and for the nature of rivalry in the form of pre-emptive strikes and technology races. We note particularly the pervasive changes that are taking place in supply chains generally. The increasing importance of connectivity and modularity is forcing a shift from competitive mode towards co-operative mode. This raises thoughts of self-organizing systems and the notion of co-evolution, rather a long way from the search for and exercise of crude bargaining power. The sheer size and cost of physical platforms also create new dynamics. The pervasive use of alliances is an obvious example. Less obvious is how the need for interoperability requires new attitudes towards complexity and requirements for agility.

A new set of strategies is emerging to offset the risks and pressures exerted by these rules. This is visible in the setting up of global standards and their ensuing platforms. For example, Group Speciale Mobile, commonly known as GSM, is an association of 600 network operators and suppliers of the mobile phone industry. Their primary objective is to set a common standard for mobile communications in order to create a homogeneous industry where equipment, software and networks can seamlessly talk to each other. Strategies of standardization are stabilizing the markets and charting the course for research and development policies.

Finally, we remark on the significance of interdependence between consumers. This effect at its strongest completely shifts our thinking from the prevalence of oligopolistic competition (size matters but so do diminishing returns) to the possibility of winner takes all and the monopoly (size matters – full stop). Clearly such network effects are not always going to be so extreme but there is a real possibility that the combination of high fixed costs, significant economies of scale, and high degrees of knowledge specialization will, when taken together with consumer bandwagons, create massive new corporate structures to which the major (and perhaps only) discipline will be further developments in technology. However, the analysis of consumer lock-in suggests the real possibility that switching costs might inhibit the adoption of valuable new technologies.

Case box: **Expectations management**

When consumers choose products in network markets, their expectations play a crucial role on sales of the products or their network components, since consumer utility depends on the number of other consumers purchasing the same products. Rival firms in the network industry influence consumers' expectations in order to maximize their profits. The process is facilitated by consumers' imperfect information about the size of the installed base in the market. Sales figures are often exaggerated to impress consumers about leadership in the installed base over rivals. The competition between OS/2 and Microsoft Windows in 1992 is an example of firms' intentions of influencing consumer expectation. IBM and Microsoft both announced wider adoption of their operating systems than actual. Later on, each company disputed the estimated numbers of sales of the other (Bensen and Farrell 1994).

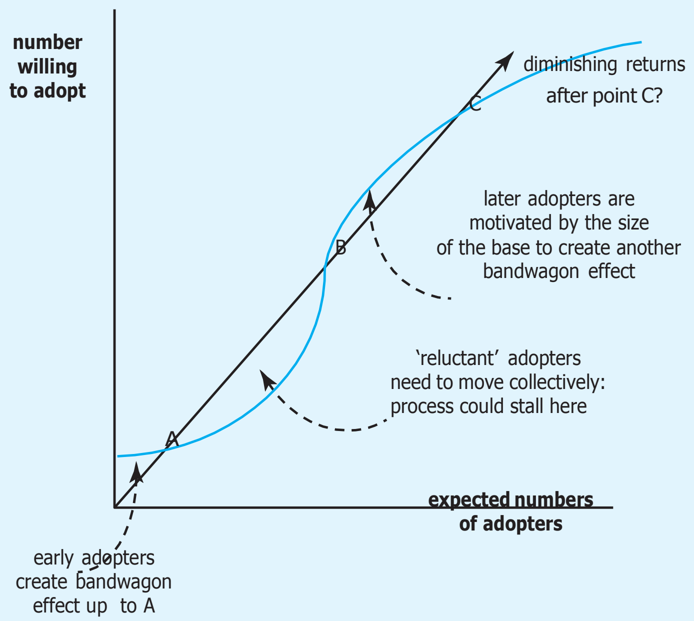


Figure 12.11 Adoption processes: networks and technologies

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

Market to create momentum:
- create the belief that this technology will be the standard

Leverage reputation:
- brands and reputation matter

Commit to 'open' standards:
- open standards can give access to volume
- proprietary standards can result in small niches

Win over an influential buyer
- e.g. supermarkets and UPCs (barcodes)

Advance sign ups:
- prior commitments create confidence

Wink at piracy:
- adoption at zero price is better than no adoption

Pricing:
- leasing, long-term contracts, give-aways, penetration pricing

Figure 12.12 Managing the adoption process

Expectation management is a strategic device that goes beyond the inflation of penetration figures and moves into the realms of brand and corporate image building. In competing to become market leaders in the mobile communications industry, or at least to achieve critical mass, consumer expectations were significant. The mobile company that was expected to grow the fastest would gain most market share. Self-fulfilling expectations are one manifestation of positive feedback economics and bandwagon effects. The mobile industry has made consistent use of semiotics in expectations management through its media campaigns. Images, music themes and slogans are used to imply magnitude and leadership.

The model in Figure 12.11 illustrates the adoption process. Adoption typically follows an S-shaped pattern around the long-term trend growth rate. The early adopters ('anoraks') rush in. There is then a pause while the prospective early adopters make up their minds – marketing is focused on persuading them to move quickly and decisively so as to create a rapid growth that will become self-sustaining (through point B in the diagram). Following this, the push to sustain the market through attracting late adopters is the next marketing focus. This suggests some rules for marketing – these are summarized in Figure 12.12. Marketing is about creating momentum so as to minimize the risks that are endemic in this new world. Brands and reputation are, if anything, even more important. The emphasis is on volume, so open standards are attractive and low, penetration-style pricing will be common.

Vodafone's corporate image campaign in its early days included images of the Thames Barrier and the cliffs of Dover. Symbols of national interest were used to give the subliminal message that Vodafone will succeed throughout the UK. The musical theme in the Thames Barrier campaign was from *Close Encounters*, implying universal reach. The cliffs of Dover campaign involved the draping of a large section of the cliffs with material, by a contemporary artist. The message could have been directed at conquering 'coverage' issues of radio transmission. Orange has had one of the most famous slogans in UK media history: 'The future is bright, the future is Orange'. One2One has had equally expansionist media campaigns, particularly with its award-winning 'Welcome to Our World'. All these campaigns imply market leadership and a sense of network growth.

The effects in Figure 12.11 can be seen in research by Huberman (1988), which shows how consumers' expectations are being linked to the critical mass. The stronger the consumers' expectation that a new network will be widely adopted in the future, the faster the market reaches critical mass. Once a critical number of users is achieved, the rate of increase of new users increases exponentially, up to the limit of the user population (or to some other natural limit; *see* Figure 12.11). The implication for strategists it that the time required to achieve critical mass can be reduced in proportion to the degree of optimism of people's expectations.

Hence, strategic action aimed at increasing consumers' expectations of the success of a new product would have a double effect of inducing more new users, who in turn influence even more users. This effect can be powerful – Huberman's simulations demonstrate that even if there is only a small group of individuals with double the propensity for innovation in relation to the group average, the critical mass can be reached very rapidly. This has been evident in the mobile telecommunications industry. Once the phones were affordable and accessible to the youth market (the early adopters), sales boomed for this particular segment. As a result even more users from other segments were attracted to the market.

12.7 Summary

Thus, the brave new world has a sting in the tail. The pervasive development of the ICT industries has promoted, and continues to promote, very substantial consequential changes throughout the economy. In doing so, industry economics and dynamics do change and significant adaptations have to take place in order to avoid getting run down by the juggernaut. Changes are needed in the nature of the corporate strategies and in the mindsets required. Where the conjunction of certain technological and consumer circumstances takes place, the strategy game becomes a very direct race to establish dominant position. Even where such games fail to achieve their objectives, the cost of unproductive investment could be enormous. Where they in fact succeed, many will nevertheless have failed, and we would also face the difficulties in managing the consequences of de facto monopoly. The data available does not suggest that winner takes all is likely to be a frequent phenomenon. However, all the other indications suggest that various forms of scale-intensive, pre-emptive strategies will become much more common (see, for example, the telecommunications boom and bust). But as a counterpoint we can also see that there are very considerable forces promoting more co-operation and stronger incentives towards a much more subtle blending of co-operative and competitive modes of practice within industries.

Reference of Published Version

Sammut-Bonnici, T., & McGee, J. (2010). Network Strategy in the Digital Economy. In J. McGee, H. Thomas & D. Wilson (Eds.), Strategy: Analysis and Practice (2nd ed.,). UK: Maidenhead: McGraw-Hill.

Key terms

Architectural innovation *478*
Consumer externalities *462*
Consumer network *480*
Critical mass *466*
Expectations management *485*
Installed base *467*
Interoperability *479*
Isomorphism *476*
Lock-in *481*
Modular innovation *478*
Multiplier effect *459*
Negative feedback systems *468*
Network externalities *458*
Network industries *461*
New economy *484*
Open standards *485*
Physical platforms *478*
Pure network good *469*
Real and virtual networks *464*
Standards *472*
Standards versioning *473*
Switching costs *473*
Technical platform *473*
Tipping point *467*

Recap questions and assignments

1. Explain how network externalities might (or might not) occur in the following situations, paying particular attention to the way in which critical mass is reached:
   (a) The Apple – IBM PC battle in the PC industry;
   (b) The mobile telecommunications industry;
   (c) BSkyB and the satellite TV market.
2. For the situations in question 1, give examples of co-evolution and/or cooperation. In which case is co-operative behaviour most marked? Why?
3. For any internet-based business with which you are familiar, explain its business model and compare it to any one of the business models discussed in Chapter 6.

Online Learning Centre

When you have read this chapter, log on to the Online Learning Centre website at www.mcgraw-hill.co.uk/textbooks/mcgee to explore chapter-by-chapter test questions, further reading and more online study tools for strategy.

Case 1 How good is Google?

If the ultimate measure of impact is to have one's name become a new verb in the world's main languages, Google has reason to be proud. When they founded the company five years ago, Sergey Brin and Larry Page, friends at Stanford University, chose a word play on 'googol' – the number 1 followed by 100 zeros – because their ambition was to organize the information overload of the internet in a transparent and superior way. These days, singles 'google' suitors before agreeing to a date, housewives 'google' recipes before cooking, and patients 'google' their ailments before visiting doctors. Dave Gorman, a comedian, even has a popular show, the 'Googlewhack Adventure' – a Googlewhack being what happens when two words are entered into Google and it comes back with exactly one match.

As search engines go, in other words, Google has clearly been a runaway success. Not only is its own site the most popular for search on the web, but it also powers the search engines of major portals, such as Yahoo! and AOL. All told, 75% of referrals to websites now originate from Google's algorithms. That is power. For some time now, Google's board (which includes two of Silicon Valley's best-known venture capitalists, John Doerr of Kleiner Perkins Caufield & Byers and Michael Moritz of Sequoia Capital) has been deliberating how to translate that power into money. They appear to have decided to bring Google to the stockmarket next spring. Bankers have been overheard estimating Google's value at $15 billion or more. That could make Google Silicon Valley's first hot IPO since the dotcom bust, and perhaps its biggest ever. That alone is enough to have some sceptics whispering 'Netscape'. Now that the worst of the dotcom hangover is clearing, they wonder, will Google become one of the few valuable internet survivors, joining Amazon and above all eBay? Or will it simply be the next over-hyped share sale to make its founders rich only to wither away miserably, either for lack of a sustainably profitable business model, or, like Netscape, because it finds itself in the path of that mighty wrecker, Microsoft?

The search for profits

Google, naturally, is determined to avoid Netscape's fate at all costs. This was why it made Eric Schmidt its chief executive in 2001. Mr Schmidt was 46 at the time – Messrs Brin and Page were in their twenties – and was the boss of Novell, a software firm decimated by Microsoft but given another lease of life under his leadership. He seemed suitably 'adult' to turn Google into a money-making machine.

Mr Schmidt understood that the key to monetising all those customer searches (now 200m a day) was to place small, unobtrusive and highly relevant text advertisements alongside Google's search results. Advertisers like this system because they pay only if web surfers actually click on their links. And consumers either do not mind, or even learn to love these commercial links for their relevance, just as they appreciate the Yellow Pages.

Google did not pioneer this 'paid search' advertising. That honour falls to Overture, a Californian firm bought this year by Yahoo! which still has about half of the $2 billion-or-so market. Nor did Google's founders readily embrace the concept. Mr Page was once heard to say at a trade show that commercial exploitation was 'bastardising' the search industry. Mr Schmidt made the concept uncontroversial at Google, thereby helping paid search to become the fastest growing part of the advertising industry today.

The next step is to take this approach to advertising from the results pages of search engines and on to other web pages. Increasingly, web publishers – from hobby bloggers to small businesses – allow firms such as Google to crawl through the content of their pages and place relevant text advertisements in the right margin. Once page visitors click on the links, the webmasters share the revenues with Google. At a stroke, this so-called 'contextual advertising' makes much of web publishing self-financing. This may result in better web content by making hitherto unprofitable online activities economically viable.

Meta Group, a consultancy, reckons that the market for paid search and other contextual advertising will grow to $5 billion by 2006. This is Google's main market opportunity (although it also gets some revenues from licensing its search technology). Currently, Google is thought to make annual profits of about $150m. To be worth the rumoured $15 billion for longer than it takes a bubble to burst, it will need to raise its profitability substantially. That means matching such internet stars as eBay (market capitalisation $37 billion), but without the natural-monopoly advantages that have made eBay so dominant – the classic network effect of buyers and sellers knowing they do best by all trading in one place. For Google to stay permanently ahead of other search-engine technologies is almost impossible, since it takes so little – only a bright idea by another set of geeks – to lose the lead. In contrast to a portal such as Yahoo!, which also offers customers free e-mail and other services, a pure search engine is always but a click away from losing users.

The arrival of competitors

Yahoo!, in fact, will probably be the first to attack. It now owns rival search technologies including AltaVista, AlltheWeb and Inktomi. With the contextual-advertising technology of Overture, Yahoo! now has under its own roof all the elements of the business model that made Google such a success. It cannot be long before Yahoo! turns from a lucrative customer of Google's into a powerful rival.

Even more frightening (especially to those who remember Netscape's fate in the browser wars), Microsoft smells blood. It is currently working on its own search algorithm, which it hopes to make public early next year, around the probable time of Google's share listing. Historically, Microsoft has been good at letting others (Apple, Netscape, Real) pioneer a technology before taking over, exploiting its dominance in desktop operating systems.

Google the new-age advertising agency makes money, but it is Google the search engine that builds the consumer brand which makes the ad agency powerful. Whenever users click on advertisements on Google's own site, Google gets all the revenues. Whenever users stray to other search engines, even ones where Google has placed sponsored links, Google has to share the revenues with the site owner. As the competition between Google, Overture and others heats up, Google's profit margins will fall.

This may already be happening. Craig Pisaris-Henderson, the chief executive of FindWhat.com, a smaller rival to Overture and Google in contextual advertising, reckons that Google's operating margins on sites other than its own must be much worse than FindWhat.com's (23%) or Overture's (12%) because it has been wooing advertisers away from Overture by being more generous to webmasters.

One thing that might help against Microsoft, says Danny Sullivan, the editor of SearchEngineWatch.com, an online consumer guide to the industry, is Google's image of 'niceness' – at least by implicit comparison with the forces of darkness in Redmond. Scott Banister, a pioneer of paid-search technology (and now a founder of IronPort, an e-mail infrastructure firm), thinks that Google has already built sufficiently deep networks with advertisers to mount an effective resistance to Microsoft's impending assault.

Even so, Google is no sure thing – as those who hope to sell its shares are no doubt aware. John Doerr and Michael Moritz, for instance, between them also brought Netscape and Yahoo! to market, and may remember their lessons. With luck, Google's owners will remember to work out a viable strategy for Google beyond the point at which they cash out.

Source: ***The Economist***, 11 January 2003, Vol. 369, Issue 8348, p. 57.

Case Questions

1 Describe Google's strategy and explain how its business model works.

2 What are the risks facing Google and how can it defend itself against them?

3 What characteristics of the 'new economy' are present in this case? To what extent do these characteristics make the analysis of Google's competitive position and its future strategic choices unique or unusual?

Case 2 **Browser wars, part two**

Remember the browser wars, when Netscape and Microsoft fought for dominance of the web? For a while, each rushed out ever more complex browsers in the software equivalent of an arms race. In the end, Microsoft prevailed by bundling its browser with its Windows operating system.

That fight may, however, prove to have been just a warm-up. Now a new browser war is under way, as software firms compete to provide the browsers for 'information appliances' such as set-top boxes, handheld computers and smart phones. Such devices are still in their infancy, but they are widely expected eventually to outnumber PCs. So the stakes in this new browser war are high. And this time round, the battlefield looks very different.

For a start, Microsoft is almost nowhere to be seen. Its strongest weapon in the desktop browser wars – the ability to include new software as part of Windows, and thus ensure its installation on millions of PCs – no longer works. Microsoft's cut-down version of Windows for appliances has been a flop, and the firm's strategy of tying its browser to its operating system is no help if that system is not dominant. But Netscape, which is now part of AOL, is still very much in the running, alongside dozens of rivals including Opera, OpenTV, Lineo, QNX and Pixo.

Another difference is that the appliance makers and service providers (such as cable-TV and mobile-phone companies) will decide which browser comes installed on a particular device. On a PC, a new browser can be downloaded and installed with a few clicks. Not so with appliances, whose users will have no choice in the matter. Rival browser makers are thus courting appliance makers and service providers, rather than trying to woo users. To maximise its chances in this beauty contest, a browser must be fast and work with many different kinds of hardware.

With so many firms in the race, it seems unlikely that any browser will win a dominant share. The resulting diversity will mean that, for everything to work properly, it will be vital that web pages and the browsers that display them conform to the technical standards laid down by the World Wide Web Consortium (W3C). So browser makers are rushing to show how well-behaved their software is. Contrast this with the old Microsoft-Netscape battle, when both firms added proprietary extensions to existing web standards in an attempt to lock in users.

Netscape claims that its software, called Gecko, is the most standards-compliant browser around. Jon Stephenson von Tetzchner, Opera's boss, makes a similar claim about his firm. The problem, he says, is that only 5% of web pages comply with W3C standards. Most are designed to look good on Netscape's or Microsoft's old browsers, rather than playing by the rules. On December 6th, Opera said it will offer the Windows version of its browser free. The idea, says Mr von Tetzchner, is to increase Opera's market share and to encourage web designers to look beyond the 'big two' browsers to a more diverse future.

This is just one of the many subtle links between the old and new browser wars. Netscape's new strategy is similarly informed by its bruising previous encounter with Microsoft. By making Gecko freely available, and encouraging its use with the free Linux operating system, it hopes to allow appliance makers to avoid 'vendor lock-in'. Netscape does not benefit directly from this strategy, but the result is to make it hard for any single firm (i.e., Microsoft) to establish a stranglehold on the market. Although the new browser wars are very different from the old, in some respects little has changed.

Source: 'Browser wars, part two', ***The Economist*** 14 December 2000.

Case Questions

1 What was Microsoft's strategy in the first browser wars? How important were network externalities in its thinking?

2 Why is the new generation of browser wars different? Does Microsoft now have a competitive disadvantage?

Further reading and references

Arthur, B (1996) 'Increasing Returns and the New World of Business', ***Harvard Business Review***, July/Aug.

Arthur, WB (1989) 'Competing technologies, increasing returns, and lock-in by historical events', *Economic Journal*, **99**, pp. 116 – 31.

Arthur, WB (1990) 'Positive feedback in the economy', *Scientific American*, **262**, pp. 92 – 9.

Baumol, W, Panzar, J and Willig, R (1982) 'Contestable markets and the theory of industry', *American Economic Review*, 72.

Bensen, SM and Farrell, J (1994) 'Choosing How to Compete: Strategies and Tactics Standardization', *Journal of Economic Perspectives*, Spring.

David, PA and Shurmer, M (1996) 'Formal standards-setting for global telecommunications and information services: towards an institutional regime transformation', *Telecommunications Policy*, 20, 10.

David, PA and Steinmueller, WE (1994) 'Economics of Compatibility Standards and Competition in Telecommunication Networks', *Information Economics and Policy*, 6.

Digital Planet (2002) ***The Global Information Economy***, Data by International Data Corporation, World Information Technology and Services Alliance, USA.

DiMaggio, PJ and Powell, WW (1983) 'The iron cage revisited: institutional isomorphism and collective rationality in organizational fields', *American Sociological Review*, **48**, April, pp. 147 – 60.

Dumont, B (2000) Book Review of Carl Shapiro and Hal R. Varian, Information Rules: A Strategic Guide to the Network Economy, *Journal of Network Industries,* **1**, **1**, pp. 101 – 7.

Economides, N (1996) 'The economics of networks', *International Journal of Industrial Organization*, **14**, **2**, pp. 675 – 99.

Economides, N and Flyer, F (1997) 'Compatibility and Market Structure for Network Goods', Discussion Paper EC – 98 – 02.

Ellis, HS and Fellner, W (1943) 'External economies and diseconomies', *American Economic Review*, 33.

Evans, P and Wurster, TS (2000) ***Blown to Bits***, Harvard Business School Press, Boston, MA.

Evers, J (2002) 'Siemens joins Symbian Consortium', IDG News Service, Amsterdam Bureau, ITworld.com 4/23.

Garud, R, Kumaraswamy, A and Prabhu, A (1995) 'Networking for Success in Cyberspace', *IEEE Proceedings of the International Conference on Multimedia Computing and Systems*, pp. 335 – 40.

Henderson, RM and Clark, KB (1990) 'Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms', ***Administrative Science Quarterly***, 35.

Huberman, BA (1988) ***The Ecology of Computation***, Elsevier Science Publishers, Amsterdam.

Katz, M and Shapiro, C (1985) 'Network externalities, competition and compatibility', ***American Economic Review***, **75**, **3**, pp. 424 – 40.

Kelly, K (1994) ***Out of Control – The New Biology of Machines***, Addison Wesley.

Kelly, K (1998) 'New Rules for the New Economy: 10 ways the network economy is changing everything', Fourth Estate.

Knight, FH (1924) 'Some fallacies in the interpretation of social cost', ***Quarterly Journal of Economics***, 38.

Langlois, RN and Robertson, PL (1992) 'Networks and Innovation in a Modular System: Lessons from the Microcomputer and Stereo Component Industries', ***Research Policy***, **21**, **4**, pp. 297 – 313.

Leyden, P (1997) 'Moore's Law Repealed, Sort of', ***Wired***, Issue 5.05, May.

Liebowitz, SJ and Margolis, SE (1990) 'The Fable of the Keys', ***Journal of Law and Economics***, Vol. XXXIII, April.

Liebowitz, SJ and Margolis, SE (1999) ***Winners, Losers & Microsoft***, The Independent Institute, Oakland.

Mathews, JA (2002) 'Strategizing vs Economizing: Theorizing dynamic competitive behaviour in disequilibrium', unpublished paper, November.

McGee, J and Sammut-Bonnici, T (2002) 'Network Industries in the New Economy: the Effect of Knowledge and the Power of Positive Feedback', ***European Business Journal***, September, **14**, **3**, pp. 116 – 32.

Morris, CR and Ferguson, CH (1993) 'How Architecture Wins Technology Wars', ***Harvard Business Review***, **71**, **2**, pp. 86 – 96.

Pesola, M (2002) ***Financial Times***, 11th April.

Saloner, G, Shepard, A and Podolny, J (2001) ***Strategic Management***, Wiley, New York.

Sammut-Bonnici, T and McGee, J (2002) 'Network Strategies for the New Economy: Emerging Strategies for New Industry Structures', ***European Business Journal***, December, **14**, **4**, pp. 174 – 85.

Shapiro, C and Varian, H (1999) ***Information Rules: A Strategic Guide to the Network Economy***, Harvard Business School Press, Boston, MA.

Sharkey, NE and Sharkey, AJC (1993) 'Adaptive generalisation and the transfer of knowledge', ***Artificial Intelligence Review***, Special Issue on Connectionism, **7**, pp. 313 – 28.

Shy, O (2001) ***The Economics of Network Industries***, Cambridge University Press, Cambridge, UK.

Vercoulen, F and Wegberg, M (1998) 'Standard Selection Modes in Dynamic, Complex Industries: Creating Hybrids between Market Selection and Negotiated Selection of Standards', NIBOR Working Paper, nib98006, Maastricht.

Weiss, T (2001) ***Computer World***, April 2.

Young, AA (1913) 'Pigou's Wealth and Welfare', ***Quarterly Journal of Economics***, 27.