SEIZING BUSINESS OPPORTUNITIES & UNDERSTANDING THE ECONOMIC RISKS OF NEW PRODUCTS IN A MULTI-FACETED MARKET

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ABSTRACT

As we move into the next millenium, exciting leading-edge technologies will offer businesses unparalleled opportunities to seize rich new markets. However, the prospect of these enormous new revenues must not be allowed to blinker the vision of strategic business planners. They must understand the risks as well as the opportunities. Furthermore, the complex interacting requirements of their multi-dimensioned resources and the multi-faceted customer market must be understood. Frequently, it will be important to mine through the web of opportunities to target resources at those products for which the customer market will offer the greatest return on investment and the lowest risk.

A Systems Dynamics modelling technique, which is used to explore the futuristic market opportunities available to telecommunications companies, will be discussed. Its prime objective is to identify how to seize market share by prioritising resources at particular products through understanding the multi-faceted customer base. Customer takeup of new products (or services), service usage, costs, revenues and profit will be discussed with respect to the business opportunities available.

The technique for breaking down the complex problem space into small, manageable, testable units, (which can be modelled as reusable modules), will also be discussed. The way in which these modules are subsequently bolted together to form a large, seamless, elaborate and powerful model, for the analysis of "What-if" business scenarios, will be shown. Most importantly, it will be demonstrated that this technique for telecommunications, can be reapplied to any business market.

INTRODUCTION

In today's fast moving market-place, all companies need to maintain a strong competitive edge. This is irrespective of the types of products, (or services), they provide. To achieve this, their products should be keenly priced with a low cost base, and the highest possible return on investment. As it is unlikely that all consumers will prove to be equally profitable, it is of prime importance to identify which sectors of the consumer market are most likely to purchase the goods or services. This enables effective targeting of marketing and the matching of company resources to customer demand.

Furthermore, it is important to assess how this consumer market will change with time. This change may be according to the time-of-day, or seasonal or show long-term trends over months or years, or be a combination of any of these time factors. By understanding these time-varying, dynamic customer characteristics, strategies can be put in place to enable the company to evolve and progress, whilst still maintaining its competitive advantage.

A generic Systems Dynamics modelling technique, using the "PowerSim" tool, has been developed by BT Laboratories. It assesses the dynamic effects of

- customer behaviour
- products and services launch
- tariffing
- costs of provision
- revenue
- profit.

In the early parts of this paper, the generic technique will be discussed. It will be shown how it is very important to develop a model which is modular in format, and reusable for a wide variety of situations. Later, a specific example relating to telecommunications will be given to illustrate the principle involved.

UNDERSTANDING THE PROBLEM SPACE

Obviously, the model developed by BT is applied to the telecommunications arena. However, to develop the principle, and show that it is generic, let us reflect on what at first sight appears to be a completely different paradigm. So, let us choose an example which should be familiar to us all. Consider now the questions that must be answered by planners wishing to build a grocery superstore, (or K-MART), and optimise its financial return. Consider that this is a very large store, which stocks a wide variety of fresh and processed food as well as non-perishable household goods. The key issues, facing the store planners, are illustrated in the flow diagram shown in figure 1a.

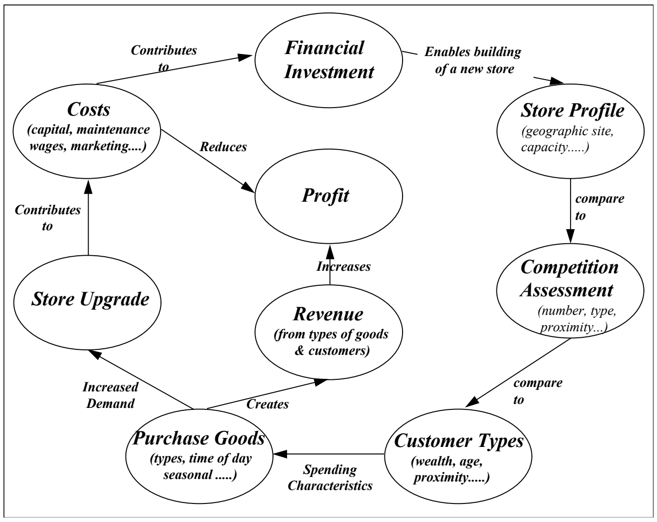


Figure 1a. Flow Diagram for the Grocery Superstore, (K-MART), Problem Space

The planners will be allocated a certain *Financial Investment* which will enable them to build a superstore whose capacity, stock and facilities will depend upon the geographic site of the store, particularly with respect to the *Competition* and the *Customer-Types* within its catchment area.

Firstly, they must assess the effects of existing and planned *Competition* from other stores within the area. This is of prime importance as it may affect the decision to abandon the project or to go-ahead and build the store.

The planners must then assess the *Customer-Types* that could be using the store. These *Customer-Types* will be dependent upon a number of factors such as wealth, age, gender, status within the family and the *Proximity* of the *Customer* to the store. This *Proximity* will be a function of the status of the roads leading from the *Customer s* home to the store, and the access that the *Customer* has to transport, (such as private car, public transport, and so on).

Once the store is built, the *Customers* will be able to *Purchase Goods* which will create *Revenue* for the store. However, the *Customers* will also have certain *Time-Of-Day* purchasing characteristics. For instance, elderly people may shop during normal office hours, whereas young professionals may shop in the evenings, and families may shop just after the end of the normal school day. Furthermore, there may be seasonal variations. For example, the sale of ice-cream may be lower in the cold winter months. There may be trends in buying habits over the years, such as an increase in the purchase of pre-packed micro-waveable meals. All of these factors impact on the *Stock* that the store must have on its shelves and in its warehouses. Thus, the *Stock* will have time-of-day, seasonal and yearly variations which are a reflection of the *Customer* buying habits.

Hopefully, over the years, the store will experience a growth in the purchase of its *Products*. This may lead to a *Store Upgrade,* which could mean that the store is enlarged to stock more goods and increase the range of its products.

Both the initial *Financial Investment* required to build the store and the *Store Upgrade* will contribute to the *Costs* incurred by the company. These *Costs* can include Whole Life Costing factors such as up-front capital investment, running costs, maintenance, power, staff wages, marketing and so on.

Then, *Revenue*, (which can be associated to types of *Goods* and *Customers),* minus *Costs* will give the *Profit* to the store.

Using this analytical approach, the complex problem space has been split into 9 modules. Each of these is relatively small and can be readily tested and validated. Then, by piecing each of the nine modules together, the large and very complex problem space can be readily modelled. However, it is important to note that each of these modules could be subdivided to bring more realism to the model. As an example let us consider just three of the modules in greater detail. Namely, *Competition, Customers* and *Goods.* Figure 2a shows how the *Competition* will be split into different Competitor companies, which we shall denote by 1, 2, 3, 4, ...M, where M is some integer.

This multitude of different *Competitors* is represented in the model as an array. Each of the *Competitors* will have certain *Geographic Locations* which will enable them to provide a range of *Goods* to a variety of *Customer Segments,* with a resulting *Revenue* and *Market Share.* These factors will all exhibit time varying trends, which will enable the planners of the new store to identify whether their individual *Competitors* are growing or losing *Market Share* and what proportions of the competitors' *Customers* and *Revenue,* they could seize. Summing the effects of all M *Competitors*, gives the total effects due to *Competiton.*

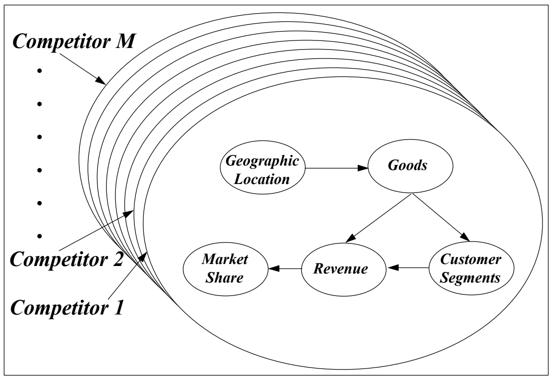


Figure 2a Understanding the Competitor Threat

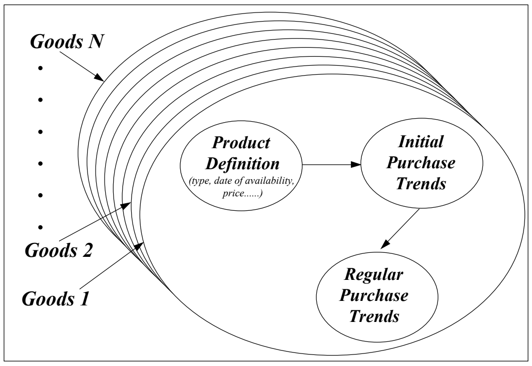


Figure 3a Understanding Customer Behaviour

Consider next Figure 3a. Here, the different types of *Goods,* (from 1 to N), offered by the store are arrayed. Each item will have an associated *Product Definition,* (such as type of product, when it is first launched on the market, its price and the quantity stocked). This item will have an *Initial Purchase Trend*, when it is first launched, which will be dependent upon factors such as marketing. After a time, once the novelty factor has subsided, the purchasing characteristics will settle into the *Regular Purchasing Trends.*

Figure 4a, shows the *Customers* of the *Goods.* Again, these are stacked in an array of different *Customer* segments from 1 to P; where the different segments could for instance, be divided according to wealth, subdivided according to family or non-family and subdivided again according to travelling time from the home to the store, and so on. For each of the *Customer* segments, there are a number of *Potential Customers*, who can become *Customers of the New Store* and create a *Usage of the Store*. This *Usage* will result in a number of *Total Purchases* which can be apportioned according to the time of day giving the *Time of Day Purchases.* Both the *Total Purchases* and *Time of Day Purchases* need to be compared to the *Store Capacity* to ensure that sufficient goods of the correct types, are stocked within the store at the times they are required.

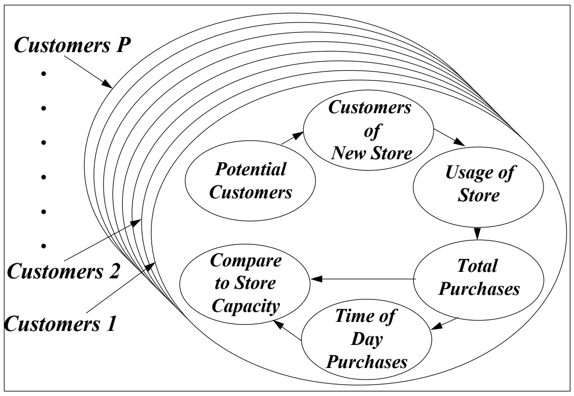


Figure 4a Matching Customer Buying Habits to Store Capacity

Consider now the complexity of the problem space. In Figure 1a, the problem space was split into 9 categories. Just 3 of these categories have been assessed in Figures 2a-4a, inclusive, with MxNxP as their total number of options to be modelled. It is easy to see, that for the complete model, the number of different scenarios that could be modelled could be extremely large. However, by maintaining the modular nature of the model, testing and validation are still relatively simple. So, errors are minimised as the model grows in power and complexity.

MODELLING THE TELECOMMUNICATIONS ARENA

Let us now consider the actual environment in which the real BT model has been developed. It is known as the "Integrated Networks & Services Model", (INSM), and has been created to assess the multi-dimensional problem space of providing a plethora of new services to a variety of customers via BT's telecommunications networks. In this section, it is intended to illustrate that the issues facings BT's network planners are very similar to those discussed in the previous section, which confront store planners. Indeed, it is hoped that by considering these similarities, for the 2 different types of planners, the reader will appreciate that these issues are the same ones that they must tackle in their own environment. In this way, the reader should be able to reapply the philosophy and methodology used within the INSM to their own situation.

To highlight the similarities between the telecommunications and store environments, the descriptions for the INSM will follow as closely as possible the descriptions for the store model. Consider Figure 1b.

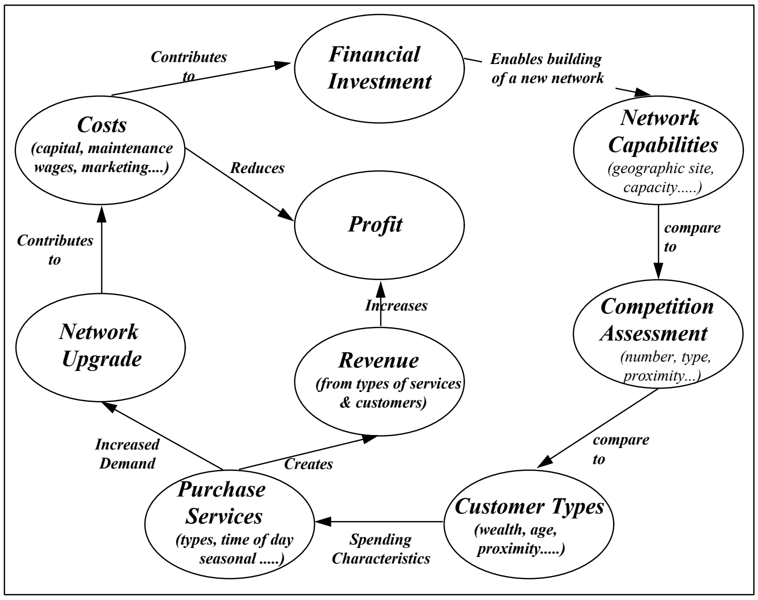


Figure 1b. Flow Diagram for the Telecommunications Problem Space

BT's network planners will be allocated a certain *Financial Investment* which will enable them to build a network whose capacity, products and functionality will depend upon the geographic distance of the network from the exchange[1], the *Competition* and the *Customer-Types* within the network's reach.

Firstly, they must assess the effects of existing and planned *Competition* from other network operators within the area. This is of prime importance as it may affect the decision to abandon the project or to go-ahead and build the new network.

BT's network planners must then assess the *Customer-Types* that could be using the new network and services. These *Customer-Types* will depend upon a number of factors such as wealth, age, gender, status within the family and the *Proximity* of the *Customer* and their network connection to the exchange. This *Proximity* will be a function of the quality of the network connections leading from the *Customer s* home to the exchange, as well as the physical distance between the home and the exchange.

[1] This distance is important as it can affect whether a *Network Service* can actually be provided to the customer, and the quality of the services.

Once the network is built, the *Customers* will be able to *Purchase Services* which will create *Revenue* for BT. However, the *Customers* will also have certain *Time-Of-Day* usage characteristics, which will lead to an increased loading on the network. This loading is known as *Traffic*. For instance, residential customers primarily use the services early in the morning and in the evening, whereas business customers primarily use the *Services* during office hours. Furthermore, there may be seasonal variations. For example, the usage of a "Networked Games" service may be lower in the warm summer months, when children are playing outside. Consequently, the *Traffic* generated by the Networked Games will be lower, at those times. There may be trends in usage patterns over the years, such as an increase in the usage of video-phone calls. All of these factors impact on the *Network Capacity* that BT must provide across its network. The *Traffic* will have time-of-day, seasonal and yearly variations which are a reflection of the *Customer* usage habits, and sufficient network capacity must be made available to cope with these differing *Traffic* demands.

Hopefully, over the years, BT will experience a growth in the purchase and usage of its *Services*. This may lead to a *Network Upgrade* so that the network capacity is increased and BT is able to provide services to more customers and increase the range and quality of the services offered.

Both the initial *Financial Investment* in the new network, and the *Network Upgrade* will contribute to the *Costs* incurred by BT. These *Costs* can include Whole Life Costing factors such as up-front capital investment, running costs, maintenance, power, staff wages, marketing and so on.

Then, *Revenue*, (which can be associated to types of *Network Services* and *Customers),* minus *Costs* will give the *Profit* to BT.

As before, the complex problem space has been split into 9 modules, each of which is relatively small and can be easily tested and validated. By piecing each of the nine modules together, the large and very complex problem space can be readily modelled. Once again, as an example let us consider the same three modules in greater detail. Namely, *Competition, Customers* and *Goods.*

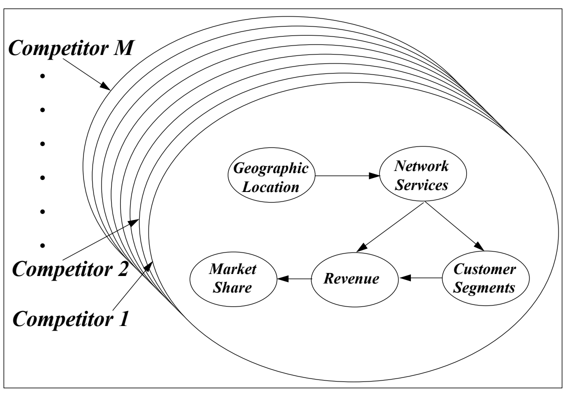


Figure 2b Understanding the Competitor Threat

Figure 2b shows how the *Competition* will be split into different Competitor companies, which we shall denote by 1, 2, 3, 4, ...M, where M is some integer. Each of the *Competitors* will have certain *Geographic Locations* which will enable them to provide a range of *Network Services* to a variety of *Customer Segments,* with a resulting *Revenue* and *Market Share.* Each of these factors will exhibit time varying trends, that will enable BT's network planners to identify whether their individual *Competitors* are growing or losing *Market Share* and what proportions of the competitions' *Customers* and *Revenue,* BT could seize. Summing the effects of all M *Competitors*, gives the total effects to BT due to *Competiton.*

Consider next Figure 3b. Here, the different types of *Network Services,* (from 1 to N), provided by BT are arrayed. Each item will have an associated *Service Definition,* (such as type of service, when it is first launched on the network, its tariff and the quality of the service). This *Network Service* will have an *Initial Usage Trend*, when it is first launched, which will be dependent upon factors such as marketing. After a time, once the novelty factor has subsided, the usage characteristics will settle into the *Regular Purchasing Trends.*

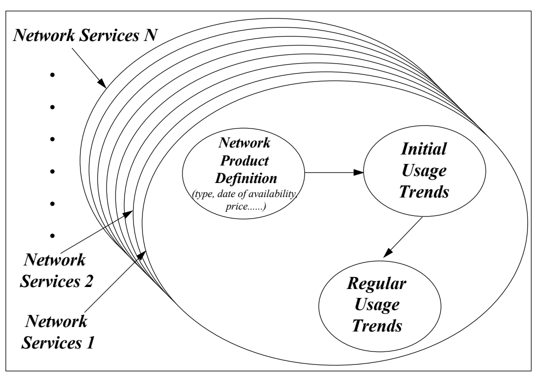


Figure 3b Understanding Customer Behaviour

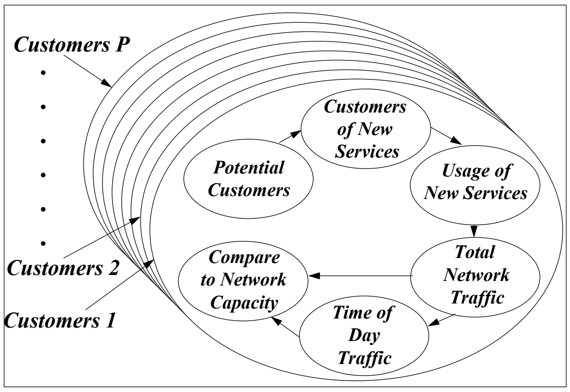


Figure 4b Matching Customer Buying Habits to Network Capacity

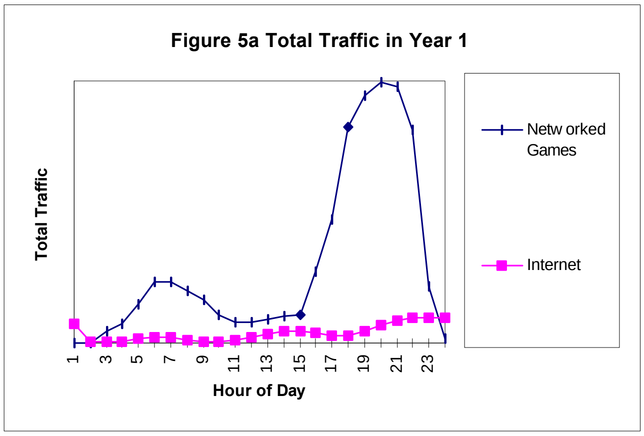
Figure 4b, shows the *Customers* of the *Network Services.* Again, these are stacked in an array of different *Customer* segments from 1 to P; where the different segments could, for instance, be divided according to wealth, subdivided according to family or non-family and subdivided again according to distance of the connection to the exchange, and so on. For each of the *Customer* segments, there are a number of *Potential Customers*, who can become *Customers of the New Services* and create a *Usage of the Service.* This *Usage* will result in the *Total Traffic* demand on the network which can be apportioned according to the time of day, giving the *Time of Day Traffic.* Both the *Total Traffic* and *Time of Day Traffic* need to be compared to the *Network Capacity* to ensure that sufficient capacity is provided within the network at those times of the day when it is required.

So, we see that the problem space facing BT's network planners is very similar indeed to the problem space facing the store planners. The challenge for the reader is to reapply this technique to their own area.

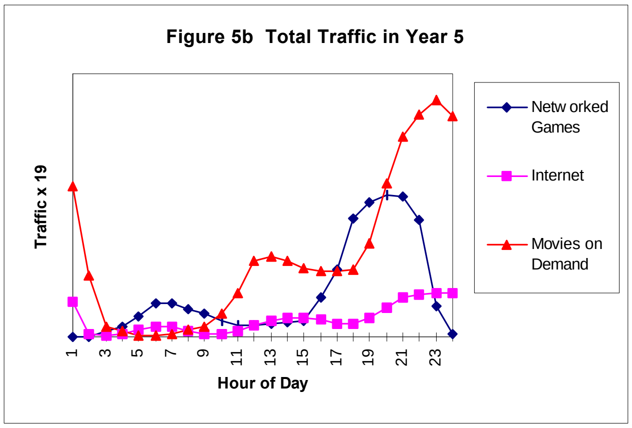
EXAMPLES OF THE OUTPUTS FROM THE INTEGRATED NETWORKS & SERVICES MODEL

As an example, consider now that BT wishes to provide 3 new networked services: Internet, Movies-on-Demand and Networked Games. These services will be provided to three different types of customer, which will be denoted as *Customer Type 1* or *2* or *3.* In competition with BT are 3 Internet Service Providers and 5 Cable TV companies. All of the competitors already have market share, in either internet provision or broadcast services, at the start of the modelling simulation, (Year 0). At this time, their market share is growing. In this particular scenario, only BT's Internet service has already been launched on to the market place, and has an existing customer base. BT's Networked Games service is launched at the start of Year 0, and BT's Movies-on-Demand service is launched at the start of Year 2. Figures 5a and 5b show that the Total Traffic generated by the summed total of all three *Customer Types* at the end of Years 1 and 5, respectively.

Notice that there is a very substantial x19.3 overall growth from Year 1 to Year 5. A considerable amount of this growth in Traffic is due to the services becoming available to a much larger number of customers. However, there is also an increase of x3.2 for the average traffic generated per customer. This is a very significant change per customer. It is due to the higher bandwidth transmission of the Internet and Games services, and the launch of a new service, Movies-on-Demand, (in Year 2). In addition, there is an increased average usage of the services by individual customers.

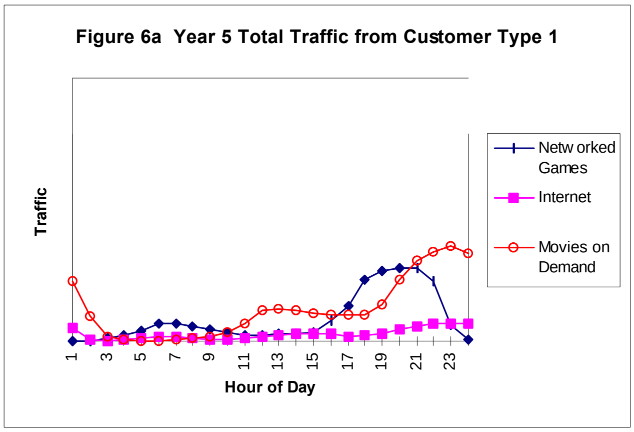


Note particularly, that the substantial x19 growth in *Traffic* has occurred even in the presence of significant *Competition.* This is indicative of the whole market growing not only for BT, but also its competitors. That is, the graphs show a very healthy and growing market for BT, (and its competitors), to compete within.

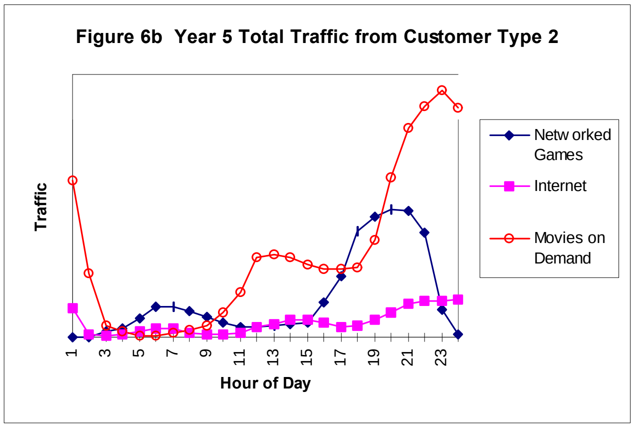


Notice too, that in Year 5, the dominant generator of BT's *Traffic* is the new Movies-on-Demand service. This shows than it is important for network planners to "future-proof" their networks by ensuring that sufficient network capacity is made available to cater for high traffic generating services which are likely to be launched in the future. Otherwise they risk being unable to support the new services or they may suffer degradations in their Quality of Service. These could potentially result in a loss of customers to the *Competition.* That is, the scenario analysis indicates that expensive over-provisioning of the network in the early years, can increase the profits in subsequent years if it more than offsets the even higher costs of later "just-in-time" network upgrades.

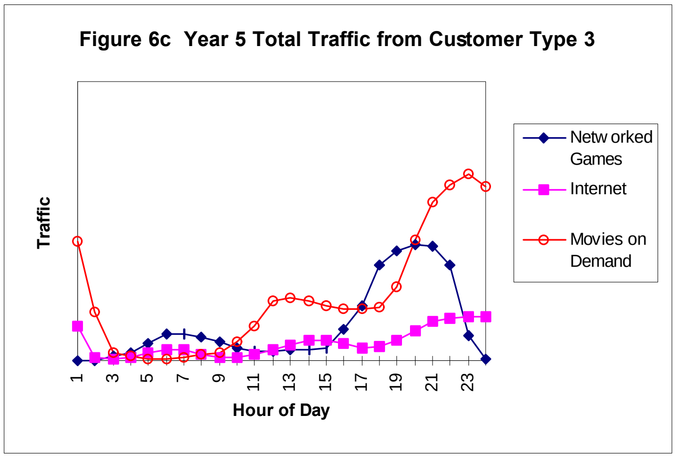
Consider now the three graphs, 6a-c, which show the traffic generation in Year 5 allocated to each of the three individual *Customer Types*. All the graphs have been plotted to the same scale on the axes. So, the higher sized plots in Figure 6b do actually represent a higher traffic generation from *Type 2* customers. The customer population can be considered to be apportioned as 27% are *Type 1*, 39% are *Type 2,* and 34% are *Type 3.*



Notice that customers of *Type 1,* have much lower usage levels of the services that either *Type 2* or *3.* However, they do still provide valuable custom, and there is a rapid growth in their usage of the network, *(Traffic),* with the corresponding *Revenue* opportunities. Although customers of *Type 1* account for 27% of the population, they only create 20% of the *Traffic.*



Notice too, that the overall growth in *Traffic* for *Customer Type 2,* is greater than that for either of the other *Customer Types.* This is for two main reasons. Firstly, more customers of *Type 2* have subscribed to the services than from the other two *Customer Types.* Secondly, individual customers of *Type 2*, typically have a high usage of the new services. This means that in areas of the country predominantly occupied by customers of *Type 2,* BT should plan its network investment and implementation to take into account large numbers of customers subscribing with typically a high usage of the services. In this way, BT should avoid the risks of having too little network capacity which would lead to either low levels of Quality of Service, or having to refuse to connect some customers who wish to subscribe to the new services. A substantial 45% of the total *Traffic* is generated from the 39% of the population in *Class 2.*



Customers of *Type 3,* have a generally lower level of *Traffic* than *Type 1.* However, notice that *Customer Type 3* has a particularly high usage of the Internet compared to the *Customers* of *Type 1* or *2.* This means, that when dimensioning its network, BT must take into account that Internet users tend to keep on-line for hours rather than minutes. So, for areas predominated by *Customer Type 3,* BT needs to have sufficient capacity within the network to allow for other network users to still have good Quality of Service, at times of the day when there is heavy Internet usage.
Customers of *Type 3,* account for 34% of the population, and generate 35% of the *Traffic.*

If it can be assumed that *Profit* to the network operator is directly proportional to the loading, (or *Traffic),* on its network, then we might suggest that it is of importance to target initial network deployment to customers of *Type 2.* The secondary target market would be *Customer Type 3,* with provision to *Customer Type 1* occurring last. However, although not illustrated in this report, the model has the ability to assess real revenue levels for given tariffing structures for the different services. Such an analysis may suggest that priority for service provision to the different *Customer Types* might be changed.

In the example given above, the provision of the network will be different for each of the *Customer Types,* as each has differing *Traffic* generation characteristics. *Customer Type 2,* have a generally high generation of *Traffic,* and it will be important that sufficient capacity is made available. That is, a higher level of network capacity, and hence higher *Investment*, must be allowed for *Customer Type 2.* However, this should be compensated by a higher *Profit.* The network requirement for *Customer Type 3* will be average, whereas a lower capacity and so lower cost network can be installed for *Customer Type 1.*

SUMMARY

The "Powersim" tool has been used to create a powerful Systems Dynamics model, known as the Integrated Networks & Services Model, (INSM). It analyses an extremely complex problem space, but maintains its simplicity and accuracy by splitting this space into a number of small modules. Each one of these modules analyses a small part of the problem such as *Customer Numbers,* or *Revenue* generation, or *Costs,* or *Service Usage*, and so on. The individual modules can be easily tested and validated. Then the complete model is formed by piecing together the modules, rather like a jigsaw puzzle.

It is important to note that the technique is generic, and can be applied to a range of telecommunications scenarios. Moreover, it has been shown that the technique can be applied to totally different paradigms, which lie outside the telecommunications arena. This was illustrated by the supermarket example.

ACKNOWLEDGEMENTS

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