The Relevance of Project Cost Information in a Modern Pharmaceuticals Company

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Abstract

The original aim of this thesis was to test the current frameworks that exist in the transfer pricing literature, Eccles (1985), Spicer (1989), and van der Meer-Kooistra (1994). The economics and marketing literatures have had success in using questionnaires in single or a limited set of companies to test transaction cost economics, and in the latter case have used structural equation modelling. Therefore this thesis originally aimed to emulate this with a questionnaire in a single pharmaceuticals company.

However measurement of the concepts used in the three frameworks proved to be problematic suggesting a need to further explore the concepts with an aim to develop better understanding of the concepts as they appear in a real world setting. Therefore this thesis switches to a case study, exploring the concepts using a modified form of Grounded Theory, with the frameworks providing Allison[1] lens on the interview data, that is, the frameworks to some extent informed the questioning and open coding, and also provided the general axial codes.

This case study demonstrated heterogeneity in respect to the relevance of accounting information for organisational units, . The embedded nature of this case study allows for comparisons between these organisational units. Objectives, strategies, and structure are found to vary along both the vertical chain and company hierarchy. This variance is driven by differences in project solidity and human capital. The use of cost allocation to projects and products is also found to vary along the value chain, from full cost allocation to no allocation of costs to individual projects.

The development process, the process of taking candidate drugs through Federal Drug Administration (FDA) phases to become prescription drugs is found to be organised as a matrix system, where the cost allocation system plays a role in

1 Allison (1971) and Allison & Zelikow (1999), in Yin (2003).

helping to allocate resources between projects. The earlier process of researching chemical compounds to become candidate drugs is found to have a different structure due to the uncertainty of projects, and where cost allocation to projects is not undertaken. It is hypothesised that uncertainty explains both the differences in structure and cost allocation system, thereby providing a link between the two. The heterogeneous nature of this case study suggests that future research should consider the use of embedded case studies as a fruitful type of research.

The three transfer pricing frameworks, although they fit the case at the corporate level, fail to explain the rich complexities of the embedded case. Furthermore, uncertainty in the form of project fluidity appears to play a greater role than van der Meer-Kooistra predicts.

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The interviewees at DrugCo[2] have, in only a modest set of interviews, provided me with a wealth of data. In particular I would like to thank John Cole & Ashwin Solanski for providing me with such good access and pointing me towards the right individuals, Paul Reynolds & Dr Rodger McMillan for providing remarkably detailed and useful answers, and most importantly Stuart Turner for providing both further access, allowing me to interview him twice, and providing feedback on my ideas.

My parents have suffered my ups & downs, not only during my Ph.D., but the preceding M.Sc. and B.Acc. as well; a debt I will never be able to fully repay. Finally I would like to thank my fiancée, Ada, for listening to my endless rants on such esoteric topics as asset specificity, refactoring, vertical integration, multi-dimensional databases, key performance indicators, and versioning systems. Unfortunately, despite her first class honours degree in accounting, including the same classification for her dissertation, I have thoroughly put her off undertaking her own Ph.D.

2 This is, rather obviously, a pseudonym.

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Chapter 1 Introduction

Beginning a Ph.D. is not a light undertaking, with three or more years ahead of the student and many uncertainties and questions. In the last year of my undergraduate degree in accounting & economics, also at Glasgow university, I began to develop a desire to explore in detail one of the topics being taught. Transfer pricing seemed to possess an attractive combination of both economics and management accounting. Initially I explored some simple economics and inadvertently reproduced Ronen's (1970) dual pricing solution. However, I needed to "find a problem", I decided to focus on the three existing frameworks to explain transfer pricing practice, Eccles (1985), Spicer (1988), and van der Meer-Kooistra (1994). In particular, the lack of verification of these frameworks suggested an opportunity to provide such a validation or refutation. Furthermore there seemed to be a possibility to combine them into a larger unified framework.

The Spicer and van der Meer-Kooistra frameworks are deduced from the transaction cost economics school (TCE). This school of economic thought explains the existence of firms by arguing that bureaucratic control is more efficient for controlling transactions, in particular more effective for preventing opportunistic misappropriation of economic rent when the transaction is frequent, uncertain or complex[3], and involves significant specific investments[4]. These three variables could be called the drivers of TCE. Transaction cost economics has been used to explain the internalisation of production and marketing operations[5], and more widely Levy (1985) found a relationship between the TCE drivers, diversification, and the extent of vertical integration.

3 The important point here is that the situation should be uncertain or complex enough to prevent near fully contingent contracts.

4 In particular the TCE school introduces the concept of asset specificity that is defined as assets that have a significantly lower value in any other available use.

5 For a review of empirical research in the economics literature see Shelanski & Klein (1995) , and for a review of both the economics and marketing literatures see Rindfleisch & Heide (1997).

Transaction cost economics provides an attractive basis for viewing management accounting systems that presumably form part of a bureaucratic control system. Spicer and van der Meer-Kooistra both explain the differences in transfer prices and the wider context, including levels of autonomy in sourcing decisions and performance measurement, with the TCE drivers.

In contrast, Eccles's framework was induced from thirteen case studies, and explains transfer prices and sourcing decision autonomy. Furthermore, Eccles' framework places the dependent variables within the context of the structure of the company, in particular he defines four centre types, the collective, cooperative, collaborative, & the competitive. These are explained by the strategy of the firm, defined as vertical integration and diversification. Levy's hypothesis that vertical integration is explained by the TCE drivers and diversification, and Grossman & Hart's (1986) hypothesis that the TCE drivers explain both vertical and horizontal integration (arguably diversification), suggests that a structural model that includes the TCE drivers as the exogenous variables, vertical integration & diversification as endogenous intervening variables, and transfer prices & sourcing decision autonomy and the dependent variables, could be tested.

More broadly we can see Eccles framework belonging to a category that views the transfer pricing problem as one based on strategy and structure, and tends to view companies as homogeneous control structures[6]. Spicer and van der Meer-Kooistra, underlining their TCE heritage, look at individual transactions. This dichotomy was one of the initial interests of the study, in particular it was hoped that some understanding of the the level at which the framework meet, assuming the frameworks could be reconciled, could be uncovered. Therefore, the research question was whether the current transfer pricing frameworks were valid explanations of the transfer pricing practice in a large pharmaceuticals company.

6 It is not entirely clear if Eccles sees individual companies as consisting of a single set of centres of the same type, or whether different types can coexist within a single company.

The popular AMOS program unfortunately was not appropriate for estimating the structural equation model (SEM) given that one of the dependent variables was categorical, instead the SEM program Mplus[7] would be more appropriate. It was hoped that a single company would provide enough sample points to test the model. Estimating structural models tends to need at least a hundred sample points. On the assumption that a single company would provide a smaller sample, the paths of the model could be modelled individually as probit or logit equations, which require smaller samples.

Toward this end a rather ambitious structural model was formulated (see illustration 1.1). This research proposal was presented at the European Accounting Associations Doctoral Colloquium in Denmark, which provided a rare opportunity to have the proposal assessed by a rather distinguished set of professors of management accounting. While the feedback was on the whole positive, one professor had concerns over the ability to find enough sample points in a single company, indeed one got the impression that the professor viewed companies has possessing of "tightly" orchestrated accounting control systems, even homogeneous systems. Thus before starting the data collection there was concern as to whether the necessary variance[8] in the company would be found for the subsequent data analysis.

7 http://www.statmodel.com/index.shtml.

8 This is "variance" in the statistical sense, since it is various forms of variance in variables that statistical models aim to use and explain.

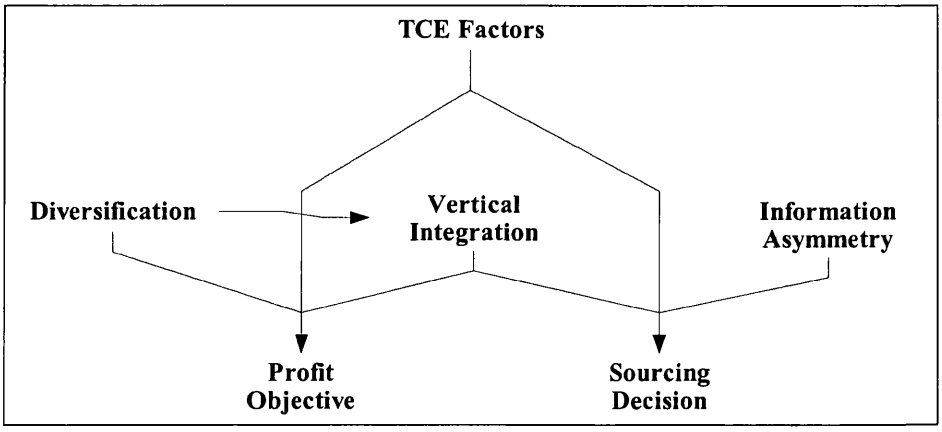

Illustration 1.1: Original Hypothesized Model

A questionnaire was developed that borrowed and adapted research instruments from previous transfer pricing and transaction cost research. Pilots against academic staff at the Department of Accounting & Finance at the University of Glasgow proved promising, the only concerns expressed were regarding the length of the questionnaire and the use of "other" boxes. However, once interviews had started, initially to gain access to the necessary participants and pilot the questionnaire, it quickly became evident that two problems existed. Firstly, as suspected, the necessary variance was not found, meaning that statistical analysis was not going to be possible. Secondly, as is covered in more detail, that is the research methods chapter, the questionnaire instruments were not working. Several problems with the instruments became evident during the initial interviews in the company, which included a failure to relate to accountants or managers, reflected in an expressed opinion of one accountant that they would have difficultly in answering the questions, and a difficulty in gaining some measure of variables, especially human asset specificity, in the relatively flexible environment of the interview.

However, it did after a while become evident that there were at least three different sets of accounting systems in operation within the company. This contrasted with the homogeneous perspective of Eccles and the afore mentioned professor, and with both the finer grained research found in the economics & marketing literatures and the implied transactional level of Spicer and van der

Meer-Kooistra. It does however mirror the case study work of van der Meer-Kooistra (1994) and Colbert & Spicer (1995), which both consisted of multi embedded case studies where each consisted of approximately two transactions in each company. However, this case study, as we shall see in chapter four and onwards, has presented several opportunities.

Firstly the case provides an opportunity to study a company, which in many respects is a service company in that its main product is new patented prescription drugs, where production is of secondary importance to the company. This compares with previous research in transfer pricing and transaction cost economics (with the exception of the marketing literature), where the cases have often been in manufacturing industries, e.g. Colbert & Spicer from the transfer pricing literature analysed electronic components manufacturers, and Masten, Meehan & Snyder (1989) from the economics literature analysed internalisation of components in the auto mobile industry. Secondly the company organises its research and development operations around projects, that is projects are the items transferred along the company's value chain, from early research to final development. Therefore the analysis has concentrated on the allocation of costs to the projects as they move along this value chain. Lastly, this company is at the extreme end of the transfer pricing/cost allocation spectrum. Transfer pricing is not used in the company, whereas cost allocation to products and projects is used. However, interestingly the use of cost allocation to projects is not universal throughout the company, but instead cost allocation is only used for allocating costs to development projects and is not used for research projects within the research organisation. In other words, project costs are only created for development projects, not research projects. Thus the company as a whole represents an embedded case study, with three distinct organisations, two project based organisations, research and development, and lastly production & marketing. This embedded nature allows for comparative analysis of the three organisations. Furthermore, as discussed in the chapter on the development organisation, further variation was found between child units within the organisation.

As the questionnaire was now seen as inappropriate for this company, a switch in approach was needed. In particular, given the unexpected extent in variation of transfer pricing/cost allocation, and the difficulty in measuring variables, especially human asset specificity, it was decided to switch to an exploratory mode of research. This exploratory mode allowed an exploration of both the nature of the variables, developing an understanding of what the dimensions of the concepts, and the apparently complex relationship between strategy, structure, and the TCE drivers. Secondly, the exploratory mode of research allowed the embedded nature of the case be be used, whereby comparisons were made between the different embedded units. In parallel to this, the research question changed from testing the current transfer pricing frameworks, to understanding the factors that explain the differences in the use of cost allocation within a large pharmaceutical company.

Grounded theory was adopted to explore the dimensions of the concepts and the relationships. Because the concepts themselves were informed by the prior three frameworks, and previous transfer pricing and transaction cost research, the form of the grounded theory used was adjusted from the type used by Glaser & Strauss. However, with the advice of Professor Holland, an effort to uncover new concepts from the interviews was undertaken, in particular an effort was made to uncover concepts noted by interviewees. An example is the ranked nature of key performance indicators.

The following chapter covers the previous research in the transfer pricing and transaction cost economics literatures, including a brief coverage of the marketing literature that has used transaction cost economics. Most importantly the three frameworks that exist in the transfer pricing literature are covered, and the need to both test and integrate these framework is explained. The next chapter gives a brief overview of the pharmaceuticals industry in the UK and the stages of prescription drug development, and the relevance these have to the costs of pharmaceuticals R&D.

After this the research methods used and the need & method of change from quantitative to qualitative grounded theory research are discussed in more detail, including an explanation of the methods used to ensure the validity and reliability of this research. This is followed by a exploration of the three organisations uncovered in the case. The dimensions and relationships of the strategy, structure, the TCE drivers, and accounting systems of each organisation are covered, and in turn a larger picture is slowly drawn by comparing the organisations. Thus each chapter provides a partial and grounded contribution to the construction of a new set of hypotheses and framework. This evidence is brought together in chapter eight, where a contrast between the three organisations are restated. This allows a number of new hypotheses to be developed that put transfer pricing and cost allocation more fully into their organisational context than found in prior transfer pricing research. Finally, in the last chapter, these new hypotheses are placed in a new framework, which is used to outline a number of future research options.

In conclusion, the Ph.D. process has demonstrated prior theoretical constructs are under specified, that prior assumptions of homogeneity in accounting information systems are optimistic, and that current frameworks do not explain the observed differences in the use of cost allocation. Future transfer pricing and cost allocation research needs to include the wider organisational context, including the complex and granular strategic and structural relationships between parent and child units.

Chapter 2 Literature Review

2.1 Introduction

The transfer-pricing problem has a substantial history, which demonstrates a progression through different approaches to the problem. While the transfer-pricing problem can be traced back to the 1920's, it could be argued that the first notable modern attempts to solve the problem began in the 1950's based on simple microeconomics and normative in nature.

By the 1920's, a number of large corporations had developed the multidivisional structure to cope with the large quantities of information that a collection of diverse vertically integrated production processes could generate. Multidivisionalisation entailed the creation of numerous profit centres, each responsible for its own profits or returns on investments. However, divisionalisation often results in some products or services being sold from one division to another within the same corporation. This creates the problem of determining a price at which the buying division is charged, and the selling division credited, for the transferred intermediate products. There is a danger that the amount transferred is not that which is optimal for the corporation as whole. In addition, the price will not be that which attributes the correct returns to the respective investments. However, in attempting to achieve and maintain optimality, heavy centralised controls may negate the benefits of divisionalisation; improved decision-making due to the localised nature of information, and improved motivation. Thus we see two objectives, namely optimisation and decentralisation.

Given the revenues of the selling division are usually the costs for the buying division, it is clear that the transfer pricing problem can be seen as a problem of profit allocation. Thus it is clear the transfer pricing can be an emotive issues for divisional management, and there is the potential for managers to game any transfer pricing system and for conflict to arise.

2.2 Simple Economics

Most reviews of transfer pricing, e.g. McAuley & Tomkins (1992) and Ezzamel (1995), start with the work of the economist Hirshleifer (1956), and no attempt is made here to differ. In line with traditional pricing theory, Hirshleifer concentrated on marginal costs. In particular two assumptions were made, demand and technological interdependence, that is the market for the intermediate good and the final product market are independent, and the cost functions of the two divisions are independent except as regards the quantity of the intermediate product transferred. Hirshleifer proposed that in the absence of a market for the intermediate good, the marginal cost of the product should be charged, whereas with a perfectly competitive market for the intermediate product, the market price (also the marginal cost) should used. Where the market of the intermediate product is imperfectly competitive in the traditional sense, then the transfer price should be set at the marginal cost where the marginal cost function equals the horizontal summation of the marginal revenue for the intermediate product and the net marginal revenue for the final product. To our knowledge, investigation of transfer pricing in the more complex world of oligopolistic modelling has not be conducted.

Unfortunately it is not hard to find problems with Hirshleifer's analysis. Firstly he intended the selling division to communicate the marginal cost function to the buying division, which equates this to its net marginal revenue function and pays a transfer price equal to the marginal cost at the optimal production level. However, if the buying division's management act as utility maximising individuals, then they would be expected to treat the marginal cost function that has been communicated as an average cost function, from which they would derive a quasi-marginal cost function. While Hirshleifer recognises this problem, he is rather quiet on how to prevent it occurring. An alternative would be for central management to determine the optimal level of production, and from this the transfer price, but this would appear to defeat the aim of

decentralisation. Only if the marginal cost function is unrelated to the quantity transferred will there be no problem. More fundamentally, the marginal approach, in common with all of the opportunity cost approaches, creates a rather perverse set of incentives. The simple Hirshleifer model demonstrates this. Firstly the selling division has an incentive to increase the marginal costs of production, thereby increasing the transfer price it receives, whereas the buying division has an incentive to increase its marginal costs or reduce its marginal revenue, thereby reducing the transfer price. More generally the marginal solution "induces a strange set of incentives, encouraging each division to limit capacity so that any profits will be imputed to use of its resources."[9] Furthermore, the accountant's proxy for marginal costs, variable costs, is likely to leave the selling division in a position of operating at a loss since fixed costs may not be covered. Lastly, the profit earned by each division is not any use in determining whether to continue or discontinue the divisions operations. That all said, opportunity cost solutions to transfer pricing are still recommended in some textbooks[10].

With the relaxing of the assumption of demand and technological independence, Hirshleifer recognised that the transfer-pricing problem becomes vastly more complicated, but did suggest the use of tariffs and subsidies[11] to counter the effects of the divisions' activities on each other. How central management would calculate the values of any tariffs or subsidies is unclear, and one suspects any attempted implementation of a scheme based on tariffs and subsidies would again begin to defeat the objective of decentralisation.

Slight imperfections to the intermediate product market were introduced by Gould (1964), in the form of constant transaction costs, such as delivery costs, whereby the buying price faced by the buying division is greater than the selling price available to the selling division, and both prices are different from the marginal cost at the point of intersection of the marginal cost function of the

9 Kaplan (1982), "Advanced Management Accounting", p. 496, quoted in Eccles (1985), p. 27.

10 For an example, see Horngren, Bhimani, Foster, & Datar (2001), pp. 646-647.

11 See Hirschleifer (1957), p. 100.

selling division and the net marginal revenue function of the buying division, Hirshleifer's solution. Three possibilities exist in Gould's model; the Hirshleifer price lies below both the buying and selling prices, the Hirshleifer price lies between the other two prices, and finally the Hirshleifer price lies above the other two. Gould's solutions for the transfer price were respectively, the market selling price, the Hirshleifer price (marginal cost), and the market buying price. These still suffer the same problems as noted above for Hirshleifer's solution, e.g. centralised decision making and perverse incentives.

A number of authors, Samuels (1969), Enzer (1975), and Tomkins (1973), seem to have noted the possibility of charging the average cost of production of the intermediate good. This solution, at least in the simple scenario should induce the buying division to operate at the corporate optimal level (maximum corporate profit). It does however reduce the selling division to the status of a cost centre.

To overcome the above problem, Ronen & McKinney (1970) suggested the use of a dual pricing system, whereby the selling division supplies the average cost function to the buying division, which is the price the buying division faces, while the buying division supplies the net marginal cost function to the selling division, which acts as a demand function for the selling division. Both divisions should be induced to operate at the corporate optimal level, and there is little need for central intervention. This method basically double counts the benefits from the joint operations of the divisions, by attributing those benefits to both divisions. This suggests there is a danger that the divisions will increase that benefit beyond what is beneficial to the corporation. The practitioners' proxy for this method is to charge the buying division the production costs, and to credit the selling division the intermediate market price.

2.3 Mathematical Programming

The above methods all assume fairly simple scenarios. The sixties and seventies introduced constraints introduced using mathematical programming methods, mostly linear. Baumol & Fabian (1964) utilised the Dantzig & Wolfe (1959 & 1960) decomposition method to devise a method of iterative communications between central management and divisional. Unfortunately, within their linear modelling, both price and quantity transferred have to be ordered by central management. Jennergen (1972) augmented the system by finishing the iterative process with quadratic schedules, negating the need to dictate the quantities that need to be transferred. Hass (1968) introduced a decomposition method that is based on quadratic programming, again negating the need to dictate quantities.

Unfortunately, these methods, while enjoying a certain amount of mathematical elegance, fall foul of the previous problem of any method based on opportunity costs, which is both divisions will have the incentive to create and worsen any capacity constraints, to the overall detriment of the corporation. Furthermore, it is empirically safe to say that none of the mathematical techniques developed in the seventies are widely used in practice, if at all. Borkowski (1990) in her survey found no use of mathematical programming for transfer pricing.

2.4 Positive Approaches

By the end of the eighties, it was evident that the mathematical programming techniques were chiefly an academic curiosity rather than a useful tool for management. Therefore research began to move away from the normative economic & mathematical techniques, and concentrate on two other approaches. The first approach concentrates on the behavioural aspects of the transfer pricing systems, mostly investigating the effects of various incentive schemes on the negotiating process via laboratory experiments. The second approach investigates the transfer pricing system in the context of the organisations, and draws on the economic explanations of the existence organisations.

2.4.1 Behavioural Approach

Ackelsberg & Yukl (1979), in the first transfer pricing laboratory experiment which this researcher knows of, found that the use of incentives based on corporate results rather than divisional results, lead to increased integrative problem solving, that is trying to achieve common goals and structuring problem solving mechanisms around these goals, and less aggressive negotiation behaviour and development of better relations between divisions, or what Ackelsberg & Yukl refer to as "smoothing". The importance of the transfer was found, unsurprisingly, to increase the size of the previous effects. Lastly, and most interestingly, the use of corporate based rewards relative to divisional based rewards was found to have a marginally positive effect on the combined profit of the two divisions. This is supported by the results of Lambert (1979), who found in his survey that the manager's belief that the transfer was beneficial to the company as a whole was negatively related to the level of conflict experienced in the company. While Ackelsberg & Yukl were cautious in drawing any conclusions, this result would appear to have some accordance with the later work of Spicer and Eccles, who both hypothesise that joint reward systems would be used when interdependencies between divisions are high.

Chalos & Haka (1990) investigated the effects of uncertainty and divisional incentive versus mixed incentive (where rewards are based half on divisional performance and half on corporate performance), on the level of inequality of performance between the divisions. Unsurprisingly they found that uncertainty and the use of divisional incentives increased the levels of inequality. In addition they investigated the effects of the two different incentive schemes on joint performance, and contrary to the findings of Ackelsberg & Yukl, they found combined performance declined as the incentive scheme moved towards joint rewards. This result can be explained with the argument that conflict in negotiations (the opposite of integrative problem solving and "smoothing") is beneficial to the company in that the conflict generates information that

ultimately improves the company's performance (contrary to Lambert's results). However it should be noted that the two sets of authors measure two different levels of joint incentive schemes; exclusively joint performance based rewards, and mixed rewards. These different results could therefore be combined in a hypothesised relationship between mutuality of the reward system and combined performance that is not linear, but concave. Starting with rewards purely based on divisional performance, as the rewards increasingly incorporate combined performance, the combined performance declines, but at some point this reverses and combined performance begin to increase. Another possibility is that joint rewards are only part of the methods employed by companies to create cooperative behaviour within corporations, and the rich mechanics are not simulated well in laboratory style experiments. While the controlled environment of the laboratory experiment allows particular relationships to be tested, it fails to place transfer pricing within its wider context. The impact of strategies, structures, politics, & history, etc, is not explored, and therefore the perceived need to place transfer pricing in a wider context has driven most of the notable research in transfer pricing since the eighties. Ghosh (2000) appears to be the sole researcher left in this field.

2.4.2 Organisational Approach

The work of Lawrence & Lorsch (1967) found that companies attempt to achieve both differentiation[12], and integration (extent of collaboration), but as uncertainty increases this becomes increasingly difficult. Extending this work, Watson & Baumler (1975) found that transfer pricing could be used to help achieve both segregation and integration of sub units within a company. Swieringa & Waterhouse (1982) presented a first attempt to interpret a case study[13] from four different organisational perspectives or models, behavioural, garbage can, organising, and market & hierarchies (transaction cost economics or TCE).

12 Measured as differences in goals, time orientations, interpersonal orientation, and formality of structures.

13 The famous Birch Paper Company.

2.4.2.1 Eccles

Eccles (1985) was the first to undertake substantial first hand empirical research that placed transfer pricing within the wider organisational context by equating transfer prices with certain organisational forms. Eccles developed his framework based on thirteen case studies of firms within the chemicals, electronics, machinery, and machinery components industries. Eccles links the transfer price and the treatment of the selling division to the company's strategy regarding the transferred product, in particular whether the intermediate product is part of a strategy of vertical integration, and whether the firm had a strategy of diversification, which Eccles' partly operationalises for individual products by asking whether the intermediate product is viewed as a product in it's own right or merely part of the final product. From these two explanatory variables, Eccles defines four organisational types: The cooperative firm, competitive firm, collaborative firm, and the collective firm, which he placed in a 2 by 2 matrix called the Manager's Analytical Plane. These firm types represent the first attempts at creating archetypes, categories of organisations with particular types of strategy, structure, and accounting information systems. These archetypes are seen again in the works of Colbert & Spicer (1995) and Speklé (2001). However, despite the extensive research into the thirteen companies, the richness of the control systems used is not explored. Methods of deriving costs, profit mark-ups, and market prices, controls on sourcing decisions, and performance measurement, evaluation, & reward systems are not explored in detail. Thus Eccles' framework remains rather simplistic. Furthermore, each company is treated as a homogeneous set of strategies, structures, and controls. This is in stark contrast to latter empirical work.

2.4.2.2 Transaction Cost Economics

The seminal work of Coase (1932) suggested that the usual explanation of firms existing to achieve economies of scale, that is reducing production costs, was incorrect. Instead Coase suggested that transaction cost associated with market transaction encourage the use of bureaucratic methods of exchange within firms and this explains the existence of firms. This work remained somewhat obscure until Williamson rejuvenated interest in the transaction cost economics theory of the firm. In particular Williamson (1985) developed a theory that allowed empiricists to circumvent the need to determine and measure the transaction costs of market and bureaucratic exchange.

Williamson's TCE is based on two main behavioural assumptions. Firstly individuals are expected to exercise bounded rationality, that is individuals will try to maximise their utility, but are constrained by a limited ability to gather and process information. This contrasts with the satisficing behaviour that it could be argued is a better approximation of human behaviour. This is possibly an important distinction that we will return to later in discussing the success of the Spicer framework that is based on the works of Williamson.

The second behavioural assumption, and one which has come in for both criticism and constructive modifications of Williamson's work, is opportunism. Individuals are expected to always act in their own self-interest, and will do so in covert ways if necessary, in other words with guile. This assumption has been the basis for some of the more fierce critics of the transaction cost economics framework. In particular Ghoshal & Moran (1996) outline two problems with the TCE framework, which they believe make "TCE bad for business". Firstly the opportunism can be dissected into two components, actual opportunistic behaviour, and the opportunistic attitude, the attitude of always seeking ones own self-interest. The TCE framework usually assumes that the latter is constant, whereas the attenuation of the former is the objective of firms. However Ghoshal & Moran suggests that the former is attenuated not by

creating fairly overt control mechanisms to prevent actual opportunistic, but by reducing the chance that individuals adopt an opportunistic attitude, by use of less overt methods, such as creating a culture of cooperation within the organisation. The second criticism that Ghoshal & Moran level at the TCE framework, is doubt of the underlying reason that TCE gives for the existence of firm, that is firms exist to prevent opportunism. Is it really the case that firms exist purely to prevent opportunistic behaviour?

Williamson, having defined the behavioural assumptions of the TCE framework, states that the market mechanism will fail in circumstances where asset specificity is high, uncertainty is high, and the transaction is frequent. Asset specificity is defined as "durable investments that are undertaken in support of particular investments, the opportunity cost of which investments is lower in best alternative uses or by alternative users should the original transaction be prematurely terminated." Asset specificity has so far been differentiated into six types. Site asset specificity relates to the proximity of the "durable assets" to the assets of the other party. Such a location reduces transportation costs, improves the timing of deliveries, and may also have other benefits. However, such costs may be greater if the transaction fails, and alternative buyers or sellers are required. Physical asset specificity refers to physical assets that are particular to the transaction such that they cannot be used efficiently elsewhere, either to supply other buyers or sold to other users. Human asset specificity refers to investments in human capital, such as training, on-site learning, research & development, that cannot be employed for any other transaction. Temporal asset specificity refers to the situation where one party places its operations in a position where on-time delivery is crucial to its operations, where buffers, for whatever reason, cannot be created to protect against poor timing. It is hard to imagine that sellers would be likely to have such types of asset specificity, but instead buyers are likely to have temporal specific assets, which contrast with the previous forms of asset specificity where sellers are more likely to make specific investments. Brand asset specificity refers to investments in creating a brand, which other parties can use but also abuse. Lastly dedicated asset specificity

refers to situations where none of the assets used are particularly special, rather they are quite general and ordinarily re-deployable, but the volume of the transfer is such that other parties could not absorb or supply the volume involved. It is important to note that specificity means specific to the other party involved in the transaction, not the product involved. These will be equivalent if the other party is the only buyer or producer of the product involved, but if they are not, then the level of asset specificity will be likely lower, even if the assets are particular to the product. Uncertainty refers to any circumstances where it is difficult to write fully contingent contracts. This means that complex circumstances as well as rapidly changing circumstances should be included in the definition.

Under conditions of low asset specificity and certainty &/or simplicity, there is little economic rent one party can appropriate from the other party, negating the need for protection, and it is easy to write fully contingent contracts to protect the investments of both parties. Where one of the parties makes investment in specific assets, a fully contingent contract, implementing contractual protecting for all cases where the other party may have the potential to misappropriate rents, is sufficient to ensure that market transaction continue to work. However in the presence of both asset specificity and uncertainty &/or complexity, contracting will not be sufficient to protect in all cases. Indeed contracting can create it's own problems. Klein's (1988) exploration of the Fisher Body-General Motors case demonstrates that contingent terms that are designed to protect one set of assets can create opportunities for one party to appropriate rents from the other. Fisher-Body required a long-term contract that required General Motors to buy metal car bodies from Fisher-Body due to the considerable investment required to produce such parts. However, once the compulsory purchase was in place, there was less incentive for Fisher-Body to minimise costs, and the contract terms designed to protect against this were insufficient. Instead hierarchical or bureaucratic control is preferred, where senior managers can act as well informed judges and order measures to prevent misappropriation. However, as noted by Ghoshal & Moran (1996), the fairly overt protective

mechanism of managerial fiat may not be the primary means of protecting specific investments. This suggests that the early version of the transaction cost theory was rather blunt in its treatment of companies as simple bureaucratic hierarchies with managerial fiat as the sole control mechanism.

However, to explain the existence of firms because of market failure is insufficient for drawing the boundaries of firms. Why can firms not incorporate markets internally, and intervene selectively when the market mechanism fails (i.e. when there are specific assets and uncertainty &/or complexity)? To put it more forcefully, why is there not just one firm in the entire world? Williamson posits a number of reasons for bureaucratic failure. Two possible reasons are loss of economies of scale and high corporate governance costs of internal organisation. If the production of a product is brought inside the single firm, and supply is limit to the needs of the firm, then the resultant lower levels of production are likely to lose economies of scale. However this argument, empirically investigated by Watson & Weber (1984 & 1986), would appear to ignore the possibility of the internalised production maintaining contact with external buyers, thus maintaining the current economies. As for the latter reason, what are the costs of corporate governance of internal organisation?

Williamson posits a number of costs to internal organisation. Firms lack the powerful incentives of the market, and may even direct managers to take actions against the best interests of the firm. Managers have an incentive to engineer the accounting rules used to judge managerial performance to maximise their own rewards. Furthermore political conflicts, undue senior management intrusion, and limited incentives, restrict the discovery and uptake of innovations. Joint and corporate wide reward systems may be prone to excessive "freeloading". Lastly senior management may not be able to intervene selectively, controlling by fiat only those transactions that exhibit asset specificity and uncertainty &/or complexity.

Monteverde & Teece (1982a & 1982b) noted that the presence of dedicated and

physical asset specificity combined with uncertainty &/or complexity, need not require non-market forms of transaction. Instead, assuming for instance the selling company has made some specific investments, it can protect itself by including a purchasing clause in the contract, requiring the buyer to purchase the assets in the event of the contract terminating. This solution is not practical if other forms of asset specificity exist. Klein's (1988) review of the Fisher Body-General Motors is again a useful demonstration of this. Fisher Body made specific investments in physical assets to manufacture the automobile bodies for General Motors. If the physical assets were the only assets specific to General Motors, then ownership of the assets by General Motors or a purchasing clause would prevent either party misappropriating rents. Fisher Body would not have made any investments that were unprotected, and General Motors could get another manufacturer to use the assets to make the bodies in the event Fisher Body pulled out of the contract. However, much of the investment by Fisher Body was in training employees for the specific transaction, that is investment in human capital. Therefore ownership of both the physical assets and the contracts with the employees is required. It could be argued that it is this ownership of both physical assets and employment contracts that defines a firm. However, this interpretation of Klein's work may be too strong. It may be that asset and employment contract ownership are only part of the definition of a firm, and that there may be other boundaries that exist.

The marketing literature has conducted a number of successful quantitative studies using TCE[14]. Uncertainty has been decomposed into environmental and behavioural uncertainty. The latter, behavioural uncertainty, is defined "as arising from the difficulties associated with monitoring the contractual performance of exchange partners"[15]. The former, environmental uncertainty, has been conceptualised in two different ways. The first conceptualises as a single concept defined as "unanticipated changes in circumstances surrounding

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2.4.2.3 Transaction Cost Economics and Transfer Pricing Research

Transaction cost literature whereby it attempts to explain the differences in organisational structures employed, to be more precise the choice between market organisation and hierarchical bureaucratic organisations, becomes appealing to management control and accounting control researchers, who may perceive that TCE may help place transfer pricing within its wider organisational context.

By adopting the TCE framework, Spicer was the first researcher to put the transaction as the unit of analysis. This makes a stark comparison with previous empirical work on transfer pricing that has tended to research companies as homogeneous units. However later empirical studies that have used the TCE as a basis for their research, especially those covered below, have failed to find the same quantity of fine-grained variation found in the TCE literature, but rather have tended to concentrate on only one or two transactions within individual companies. This suggests that the transfer pricing literature while successful at explaining the basis of transfers between profit centres, is less successful or has yet to be expanded successfully to explain the varied use of cost allocation and transfers within companies.

16 Noordewier, John, & Nevin (1990), p. 82, in ibid. p 42.

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Spicer uses the usual explanatory variables of TCE to explain not only the transfer price basis (i.e. market versus cost based), but also in the wider context, the centralisation of sourcing decisions, the use of arbitration mechanisms to resolve conflicts between profit centres, the use of performance measures & reward systems to emphasise company versus sub unit performance, and the extent of conflict between profit centres. This demonstrates, in line with the work of Eccles a move to place transfer pricing in a wider context. Spicer also gives a passing reference in his first hypothesis to the diversification strategy and organisation structure of the company. This returns us to the problematic question as to what unit of analysis, that is what level in the company, does transfer pricing operate.

Colbert & Spicer (1995) conducted an explanatory embedded multi-case study of four firms in the electronic components industry within the US, with eight transactions investigated. The study looked at the strategy and structure of the selling component divisions, and the asset specificity of both selling and buying divisions, to determine the match with the constraints imposed on the transactions and the basis of the transfer prices.

Strategy appears to be measured along a single dimension, with selling component divisions seen as providing products that are significantly important to the end product divisions, or where the selling division earns significant revenue in itself from external sales. While these definitions of strategy fit nicely with Eccles definitions, where vertical integration is operationalised as the importance of an intermediate good to a value chain, and diversification as an intermediate good being an important product in its own right, they are at odds with Eccles research that found vertical integration and diversification to be orthogonal concepts. The work of Levy (1985) found that diversification did impact on the extent of vertical integration, but not a pure correlation. Therefore we might conclude that the relationship between vertical integration and diversification probably lies between the two extreme positions of Eccles and Colbert & Spicer.

Structure has been measured according to the centre type, measured as the existence of a profit or break-even objective on internal transactions. Thus some of the divisions are profit centres but act as cost centres for internal transactions. This gives a hint that the transfer pricing literature may be extendable to comparison between cost centres, namely it would seem possible to look at differences between what costs are transferred between cost centres, for example are full costing including allocated overheads transferred, or only direct costs?

Broadly the results of Colbert & Spicer matched those predicted by Spicer's framework, however it was found that some selling divisions were constrained to sell components to buying divisions, even though the buying divisions did not have any significant assets that would decline in value if they were forced to source from alternative external sources. This mismatch was put down to historical lags, where constraints on sourcing stem from past rather than current investment priorities. However other possibilities exist. Uncertainty does not seem to have been measured, which is surprising given its importance both in the contingency literature and prior TCE research, especially in the marketing literature, where uncertainty on its own without high asset specificity has been suggested to be a cause of internalisation of sales & marketing operations. Furthermore the different forms of assets specificity outlined by Williamson (1985 & 1991), have not been differentiated, in particular human asset specificity does not appear to have been measured, which may be an oversight given the importance some of the selling divisions placed on quality of service rather than the actual component as being the source of competitive advantage over external sources.

Van der Meer-Kooistra (1994) was the first published paper to employ transaction cost economics to an embedded multi-case study. Four Dutch multinational companies, two in the chemical industry, one in telecommunications and systems development, and one conglomerate, with eleven embedded profit centres. As with Colbert & Spicer the study was

explanatory in nature in that it attempts to validate an a priori framework using the eleven selling profit centres.

The a priori framework extends Spicer's framework by differentiating between different forms of specific asset, namely, physical, dedicated, site, human, and brand[18]. Strangely the framework does not cover temporal asset specificity, even though Williamson (1991) had already outlined these extensions to the definition of asset specificity. Expanding on Monteverde & Tecce (1982a), it is hypothesised that only in the presence of the latter three forms of asset specificity will internal transfers be mandated since other contractual solutions exist to protect physical & dedicated asset specificity. The framework also introduces information asymmetry as an important variable for explaining the decentralisation of the determination of contract terms. In particular it is hypothesised[19] that in the presence of high asset specificity and high information asymmetry, the transaction will be mandated but contractual terms will be determined by the trading subunits.

Reference is made to negotiation frameworks and arbitration to resolve conflicts. However, what is never satisfactorily explained is how bargaining over contractual terms can be conducted when neither side appears to have the ability to pull out of the transaction, and therefore there appears to be no lever over which either side can bargain. This is unfortunate since the case study method provides the researcher with the opportunity to explore places where current theory is found wanting, either from a mismatch between theory and case data, or where there is omission by current theory. The case study also investigates more variables than Colbert & Spicer, namely the previously mentioned information asymmetry, and the wider context, including the performance measurement, evaluation & reward system.

As with Colbert & Spicer, the cases generally fit the predictions of the

18 Van der Meer-Kooistra (1994) refers to marketing asset specificity that appears to be analogous with what is more widely referred to as brand asset specificity.

19 Hypothesis 2b, chapter 8, section 8.4.1.

framework. However a number of problems are evident. Firstly, as with Colbert & Spicer, transactions analysed are constrained to differentiating between market and cost based transfers, with no analysis of cost transfers at a finer level of detail. Secondly, although separate measures of asset specificity appear to have been used, they are not fully reported. Thirdly van der Meer-Kooistra produces a transfer pricing decision model (p. 149), similar in style to one produced by Eccles (p. 80), which includes uncertainty as an explanatory variable, although only at the end of the decision tree, suggesting that asset specificity & frequency/size alone are enough to explain the need to mandate internal transfers. This is in contrast to the TCE literature that has found uncertainty to be an important factor, and even more unexpected and surprising given the importance stressed by the marketing TCE literature and contingency theory. Lastly it is claimed that the TCE variables explain the strategy of the cases as regards differentiation and integration. This is a difficult assertion to accept. Integration can be seen as the mechanisms developed to protect transactions and formulate contract terms. These are measured for each of the cases. However it is not clear how differentiation has been operationalised in the a priori framework or measured in the cases. Lawrence & Lorsch found a negative relationship between differentiation and integration, and furthermore they found that uncertainty exacerbated this negative relationship. It is surprising that van der Meer-Kooistra has made no apparent attempt to reconcile this with her own study.

The most recent empirical study this researcher knows of is van Helden, van der Meer-Kooistra, & Scapens (2001) who conducted a longitudinal study on the Dutch steel maker Hoogovens steel. The case study is interesting in that no changes were actually made to the transfer price or the constraints on the sourcing decisions. Steel was transferred from two business units to two other business units at cost and transfers were mandated. This did not change over the course of the study. However a profit sharing scheme was introduced in an attempt to expose business units to the market conditions of the end products. In the end the profit sharing scheme seems to have been forgotten. The case

demonstrates that the transfer price and the location of the sourcing decision are not the only factors that need to be considered. The performance measurement, evaluation, & reward system, along with the complex organisational setting need to be considered.

Thus we can see in the past decade a gradual widening of the context in which the transfer-pricing problem is framed. However, as noted before, the finer details of transfer prices and cost allocation have yet to be explored. Furthermore the impacts of the various forms of asset specificity have not been explored, except briefly by van der Meer-Kooistra. Finally, the uncertainty, so important in the TCE and contingency theory literature, seems to have played a surprisingly low-key role in previous research.

2.4.2.4 Towards Archetypes

Eccles and Colbert & Spicer have both been successful in measuring strategy & structure by the use of centre types. In the case of Eccles the cost, profit, & pseudo-profit centre, and in the case of Colbert & Spicer the profit centre with a profit objective on internal transfers, and the profit centre with a break-even objective on internal transfers. Therefore it would appear there is merit in any attempt to develop a framework of strategy, structure, and management control, which categorised using different types of centre. Speklé (2001) has made one such attempt by using transaction cost economics to develop a framework that uses ex ante programmability, idiosyncrasy, & impactedness of information[20] for post hoc performance assessment, to predict eight types of control archetype, that is market control and seven archetypes of internal control. Speklé defines a control archetype "as a characteristic, discrete configuration of control devices that is descriptively and theoretically representative of a significant group of observable management control structures and practices." Unfortunately while Speklé has spent some time exploring the different archetypes with references to

20 Speklé (2001) defines information impactedness as an extension to information asymmetry, where although both parties to a transaction have full information, it is nevertheless costly for any arbitrator to obtain the information.

previous empirical work, no systematic comparison between the archetypes is made, and therefore no dimensions are uncovered[21]. This will most likely make Speklé's framework difficult to use in any subsequent empirical study. Therefore it seems necessary that there be further exploration of Speklé's archetypes, with reference to prior empirical studies, to place the archetypes within a plane with a set of dimensions.

2.4.2.5 TCE, Uncertainty, and Task Variety & Analysability

Daft & MacIntosh (1978 & 1981) introduced the concepts of task variety, the frequency of unforeseen and novel events, and task analysability, the programmability of solutions to events. Both of these concepts would appear to fit well with the TCE concepts of uncertainty & complexity, in that both would be expected to make writing and enforcing a near fully contingent contract difficult. However, Daft & MacIntosh find that the two dimensions to task uncertainty have different effects on the use of information in companies. Task variety leads to use of more information. Task analysability lead to the use of both more and unequivocal (hard) information. How TCE and Daft & MacIntosh's results can be reconciled is unclear. Increasing internalisation due to TCE factors may result in less and softer information (including less accounting information) being used if the uncertainty is mainly due to decreasing task analysability, or more information (presumably partly made up of accounting information) if the uncertainty is due to increasing task variety.

21 A brief read would suggest a number of possible dimensions, including, the decentralisation of sourcing decisions, the size & completeness of contracts, the use of hostage arrangements & arbitration mechanisms, the PMERS, whether standards are based on behaviour or performance, style of budgeting use, monitoring systems in place, information sharing, and reputation effects.

2.5 Conclusion

We have seen that transfer-pricing research has gradually been forced to move from a normative to positive approach. The wider contexts of strategy, structure, control mechanisms, and the PMERS have been included. However, the picture so far is still rather thin. The full spectrum of transactions has not been explored. At one end of the spectrum there are variations in costs used for transfers (including the situation where no costs are transferred), and at the other end of the spectrum, the role of accounting information in hybrid organisations. The diversity and dimensions of control archetypes that may exist has not been explored.

Empirical testing of the three frameworks remains thin. Eccles (1985) has not been substantially tested. Only its originator has tested van der Meer-Kooistra (1994). Only Spicers framework has been tested. Furthermore, it is not known if the frameworks are mutual compatible or exclusive. It is these last two problems that informed the original research question, how well do the frameworks of Eccles, Spicer, & van der Meer-Kooistra, explain the use of transfer pricing in a modern pharmaceuticals company.

mechanism of managerial fiat may not be the primary means of protecting specific investments. This suggests that the early version of the transaction cost theory was rather blunt in its treatment of companies as simple bureaucratic hierarchies with managerial fiat as the sole control mechanism.

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Strategy appears to be measured along a single dimension, with selling component divisions seen as providing products that are significantly important to the end product divisions, or where the selling division earns significant revenue in itself from external sales. While these definitions of strategy fit nicely with Eccles definitions, where vertical integration is operationalised as the importance of an intermediate good to a value chain, and diversification as an intermediate good being an important product in its own right, they are at odds with Eccles research that found vertical integration and diversification to be orthogonal concepts. The work of Levy (1985) found that diversification did impact on the extent of vertical integration, but not a pure correlation. Therefore we might conclude that the relationship between vertical integration and diversification probably lies between the two extreme positions of Eccles and Colbert & Spicer.

Structure has been measured according to the centre type, measured as the existence of a profit or break-even objective on internal transactions. Thus some of the divisions are profit centres but act as cost centres for internal transactions. This gives a hint that the transfer pricing literature may be extendable to comparison between cost centres, namely it would seem possible to look at differences between what costs are transferred between cost centres, for example are full costing including allocated overheads transferred, or only direct costs?

Broadly the results of Colbert & Spicer matched those predicted by Spicer's framework, however it was found that some selling divisions were constrained to sell components to buying divisions, even though the buying divisions did not have any significant assets that would decline in value if they were forced to source from alternative external sources. This mismatch was put down to historical lags, where constraints on sourcing stem from past rather than current investment priorities. However other possibilities exist. Uncertainty does not seem to have been measured, which is surprising given its importance both in the contingency literature and prior TCE research, especially in the marketing literature, where uncertainty on its own without high asset specificity has been suggested to be a cause of internalisation of sales & marketing operations. Furthermore the different forms of assets specificity outlined by Williamson (1985 & 1991), have not been differentiated, in particular human asset specificity does not appear to have been measured, which may be an oversight given the importance some of the selling divisions placed on quality of service rather than the actual component as being the source of competitive advantage over external sources.

Van der Meer-Kooistra (1994) was the first published paper to employ transaction cost economics to an embedded multi-case study. Four Dutch multinational companies, two in the chemical industry, one in telecommunications and systems development, and one conglomerate, with eleven embedded profit centres. As with Colbert & Spicer the study was

explanatory in nature in that it attempts to validate an a priori framework using the eleven selling profit centres.

The a priori framework extends Spicer's framework by differentiating between different forms of specific asset, namely, physical, dedicated, site, human, and brand[18]. Strangely the framework does not cover temporal asset specificity, even though Williamson (1991) had already outlined these extensions to the definition of asset specificity. Expanding on Monteverde & Tecce (1982a), it is hypothesised that only in the presence of the latter three forms of asset specificity will internal transfers be mandated since other contractual solutions exist to protect physical & dedicated asset specificity. The framework also introduces information asymmetry as an important variable for explaining the decentralisation of the determination of contract terms. In particular it is hypothesised[19] that in the presence of high asset specificity and high information asymmetry, the transaction will be mandated but contractual terms will be determined by the trading subunits.

Reference is made to negotiation frameworks and arbitration to resolve conflicts. However, what is never satisfactorily explained is how bargaining over contractual terms can be conducted when neither side appears to have the ability to pull out of the transaction, and therefore there appears to be no lever over which either side can bargain. This is unfortunate since the case study method provides the researcher with the opportunity to explore places where current theory is found wanting, either from a mismatch between theory and case data, or where there is omission by current theory. The case study also investigates more variables than Colbert & Spicer, namely the previously mentioned information asymmetry, and the wider context, including the performance measurement, evaluation & reward system.

As with Colbert & Spicer, the cases generally fit the predictions of the

18 Van der Meer-Kooistra (1994) refers to marketing asset specificity that appears to be analogous with what is more widely referred to as brand asset specificity.

19 Hypothesis 2b, chapter 8, section 8.4.1.

framework. However a number of problems are evident. Firstly, as with Colbert & Spicer, transactions analysed are constrained to differentiating between market and cost based transfers, with no analysis of cost transfers at a finer level of detail. Secondly, although separate measures of asset specificity appear to have been used, they are not fully reported. Thirdly van der Meer-Kooistra produces a transfer pricing decision model (p. 149), similar in style to one produced by Eccles (p. 80), which includes uncertainty as an explanatory variable, although only at the end of the decision tree, suggesting that asset specificity & frequency/size alone are enough to explain the need to mandate internal transfers. This is in contrast to the TCE literature that has found uncertainty to be an important factor, and even more unexpected and surprising given the importance stressed by the marketing TCE literature and contingency theory. Lastly it is claimed that the TCE variables explain the strategy of the cases as regards differentiation and integration. This is a difficult assertion to accept. Integration can be seen as the mechanisms developed to protect transactions and formulate contract terms. These are measured for each of the cases. However it is not clear how differentiation has been operationalised in the a priori framework or measured in the cases. Lawrence & Lorsch found a negative relationship between differentiation and integration, and furthermore they found that uncertainty exacerbated this negative relationship. It is surprising that van der Meer-Kooistra has made no apparent attempt to reconcile this with her own study.

The most recent empirical study this researcher knows of is van Helden, van der Meer-Kooistra, & Scapens (2001) who conducted a longitudinal study on the Dutch steel maker Hoogovens steel. The case study is interesting in that no changes were actually made to the transfer price or the constraints on the sourcing decisions. Steel was transferred from two business units to two other business units at cost and transfers were mandated. This did not change over the course of the study. However a profit sharing scheme was introduced in an attempt to expose business units to the market conditions of the end products. In the end the profit sharing scheme seems to have been forgotten. The case

demonstrates that the transfer price and the location of the sourcing decision are not the only factors that need to be considered. The performance measurement, evaluation, & reward system, along with the complex organisational setting need to be considered.

Thus we can see in the past decade a gradual widening of the context in which the transfer-pricing problem is framed. However, as noted before, the finer details of transfer prices and cost allocation have yet to be explored. Furthermore the impacts of the various forms of asset specificity have not been explored, except briefly by van der Meer-Kooistra. Finally, the uncertainty, so important in the TCE and contingency theory literature, seems to have played a surprisingly low-key role in previous research.

2.4.2.4 Towards Archetypes

Eccles and Colbert & Spicer have both been successful in measuring strategy & structure by the use of centre types. In the case of Eccles the cost, profit, & pseudo-profit centre, and in the case of Colbert & Spicer the profit centre with a profit objective on internal transfers, and the profit centre with a break-even objective on internal transfers. Therefore it would appear there is merit in any attempt to develop a framework of strategy, structure, and management control, which categorised using different types of centre. Speklé (2001) has made one such attempt by using transaction cost economics to develop a framework that uses ex ante programmability, idiosyncrasy, & impactedness of information[20] for post hoc performance assessment, to predict eight types of control archetype, that is market control and seven archetypes of internal control. Speklé defines a control archetype "as a characteristic, discrete configuration of control devices that is descriptively and theoretically representative of a significant group of observable management control structures and practices." Unfortunately while Speklé has spent some time exploring the different archetypes with references to

20 Speklé (2001) defines information impactedness as an extension to information asymmetry, where although both parties to a transaction have full information, it is nevertheless costly for any arbitrator to obtain the information.

previous empirical work, no systematic comparison between the archetypes is made, and therefore no dimensions are uncovered[21]. This will most likely make Speklé's framework difficult to use in any subsequent empirical study. Therefore it seems necessary that there be further exploration of Speklé's archetypes, with reference to prior empirical studies, to place the archetypes within a plane with a set of dimensions.

2.4.2.5 TCE, Uncertainty, and Task Variety & Analysability

Daft & MacIntosh (1978 & 1981) introduced the concepts of task variety, the frequency of unforeseen and novel events, and task analysability, the programmability of solutions to events. Both of these concepts would appear to fit well with the TCE concepts of uncertainty & complexity, in that both would be expected to make writing and enforcing a near fully contingent contract difficult. However, Daft & MacIntosh find that the two dimensions to task uncertainty have different effects on the use of information in companies. Task variety leads to use of more information. Task analysability lead to the use of both more and unequivocal (hard) information. How TCE and Daft & MacIntosh's results can be reconciled is unclear. Increasing internalisation due to TCE factors may result in less and softer information (including less accounting information) being used if the uncertainty is mainly due to decreasing task analysability, or more information (presumably partly made up of accounting information) if the uncertainty is due to increasing task variety.

21 A brief read would suggest a number of possible dimensions, including, the decentralisation of sourcing decisions, the size & completeness of contracts, the use of hostage arrangements & arbitration mechanisms, the PMERS, whether standards are based on behaviour or performance, style of budgeting use, monitoring systems in place, information sharing, and reputation effects.

2.5 Conclusion

We have seen that transfer-pricing research has gradually been forced to move from a normative to positive approach. The wider contexts of strategy, structure, control mechanisms, and the PMERS have been included. However, the picture so far is still rather thin. The full spectrum of transactions has not been explored. At one end of the spectrum there are variations in costs used for transfers (including the situation where no costs are transferred), and at the other end of the spectrum, the role of accounting information in hybrid organisations. The diversity and dimensions of control archetypes that may exist has not been explored.

Empirical testing of the three frameworks remains thin. Eccles (1985) has not been substantially tested. Only its originator has tested van der Meer-Kooistra (1994). Only Spicers framework has been tested. Furthermore, it is not known if the frameworks are mutual compatible or exclusive. It is these last two problems that informed the original research question, how well do the frameworks of Eccles, Spicer, & van der Meer-Kooistra, explain the use of transfer pricing in a modern pharmaceuticals company.

Chapter 3 The Pharmaceuticals Industry & Pharmaceutical R&D

3.1 Introduction

The purpose of this chapter is to introduce some of the fundamental features of the pharmaceuticals industry in order to place the study in context. This begins with a quick introduction of the contribution of the pharmaceuticals industry to the UK economy and R&D expenditure. From this we move to outline the processes of pharmaceutical drug R&D, including the separate stages a compound or drug will go through. This leads onto a discussion of the implications of the different stages on the costs of R&D, including references to research into the growing size of R&D expenditures per drug and the difficulty of obtaining information on the costs of individual drugs. The different strategies pharmaceutical companies have adopted are discussed. Finally the history of the research site is outlined, and it's implications for this study.

3.2 Pharmaceuticals Industry

The total value of production by the pharmaceuticals industry in the UK (including both domestic & export sales) was £15.7bn in 2003, making the UK the fourth largest producer in the pharmaceutical industry, behind France, Japan, & the US[22]. This contributed a trade surplus of £3.7bn in 2004 (from £2.4bn in 2000). Furthermore, the industry employed 73000 people in 2004[23]. Interestingly the industry employed approximately the same number of people in 1990, but the number of employees involved in R&D has gone from 19000 in 1990 to 27000 in 2004, suggesting a reduction in manufacturing & management positions, and an increase in employees with scientific degrees and similar skills.

The contribution of the pharmaceuticals industry to R&D in the UK is

22 The UK two leading pharmaceuticals companies are GlaxoSmithKline and DrugCo, the second and sixth largest in the world based on prescription sales.

23 "Competitiveness and Performance Indicators 2005", Pharmaceutical Industry Competitiveness Task Force.

substantial, indeed the industry is the largest private sector investor in R&D, accounting for £3.2bn in 2004 (from £2.85bn in 2000), or £9m per day. This amounts to approximately 24% of all private investment. Furthermore, UK pharmaceutical R&D investment accounts for 9% of world pharmaceuticals investment. The UK is also a substantial source of pharmaceutical innovation, accounting for over 10% of New Molecular Entities (NME) released worldwide in the period 1995 to 2004, and of the top 75 NME's, 17 (23%) originated from the UK. In both cases only the US has contributed more.

3.3 Pharmaceutical Companies Portfolios

The portfolio of candidate drugs that a pharmaceuticals company has in its pipeline is of critical importance to the market, and annual/financial report will include one or more detailed tables of the company's current candidate drugs, categorised by therapeutic area, indicating at which phase each drug is at and estimated filing dates with both the US Federal Drug Administration (FDA) and the European Medicines Agency (EMEA).

3.4 FDA Phases[24]

The process of drug development involves 6 distinct stages[25] outlined by the FDA. The administration of both over the counter drugs and prescription drugs is undertaken by the FDA's Center for Drug Evaluation & Research (CDER), whose specialists review new drug applications (NDA) and biological licence applications (BLA) by pharmaceutical companies.

The first stage is preclinical testing where compounds are tested on animals and in laboratories. This stage can take up to three and a half years. If the compound is successful, that is, if the experiments give results such that the FDA

24 For an interactive diagram covering the FDA drug approval process: http://www.fda.gov/cder/handbook/develop.htm.

25 These 6 stages include a pre-clinical stage, 3 phases of pre-approval testing, and a review & approval process, and a final phase of post-approval testing.

is not expected to disapprove an application and the compound is assessed by the company to have sufficient potential, the company will make an Investigational New Drug (IND) application for the compound to become a candidate drug to the CDER, which leads into the 3 phases of drug development by clinical trials. The IND will include the results of previous experiments, the clinical trial protocol, which outlines the schedule of tests, the types of subject to be tested upon, dosages to be tested, etc.

Phase I involves small number of volunteers, approximately 20 to 80, aimed primarily at determining if the candidate drug is inherently dangerous in humans (the pre-clinical trials should have already established that the drug is not inherently dangerous in animals). In addition safe dosage ranges are determined and side effect identified. Pharmacokinetic studies may be undertaken to determine the absorption, distribution, metabolism and excretion of the drug. This can take a year to complete. Progression to phase II depends on the drug demonstrating acceptable levels of toxicity.

Phase II involves larger numbers of volunteers, approximately 100 to 300, primarily aimed at evaluating efficacy of the drug against placebo or different drugs. In addition there will be a continued safety assessment into the side-effects. This can take 2 years. Progression to phase III depends on demonstrating (but not proving) the efficacy of the drug.

Finally phases III moves to large scale clinical trials, involving 1000 to 3000 volunteers, with the purpose of verifying the side effects of the drug, determining the long term effects of usage, and verifying the efficacy relative to other drugs for the condition(s). This takes 3 years to complete.

It should be noted that pharmaceutical companies often have to pay doctors/hospitals for access to patients for clinical trials, and indeed this is one of the big costs in pharmaceutical R&D. One manager estimated that the costs of the clinical function was larger than the whole of the research organisation.

Therefore, the increasing number of volunteers required for each successive phase, result in increasing costs a candidate drug as it progress through the trials. This underlines the importance of determining if a drug is not successful as soon as possible thereby avoiding the larger costs of development further along the development process.

Successful completion of the 3 phases results in a NDA filing with the CDER. The actual review and approval process by the CDER can take two and a half years, although the CDER claims that 90% are handled in 10 months[26]. Assuming this process is successful, the drug becomes a prescription drug. All told the whole process from compound to prescription drug can take 12 years[27]. A final phase IV of post marketing testing is required by the CDER.

3.5 Pharmaceutical R&D Costs

As already noted above the costs of pharmaceuticals R&D generally increase further along the value chain. DiMasi et al. (2003) using a sample of 68 compounds, estimated the cost of each phases to be $15.2m, $23.5m, & $86.3 for phases I, II, & III respectively[28]. In addition, DiMasi et al. estimate that once costs of capital (at a high 11% real rate of return) and drug failure rates (80%) are taken into account, the total cost of developing a new prescription drug, that is up the point of final FDA approval, is $802m[29].

When compared to their earlier study DiMasi et al. (1991), which estimated a total cost of $318m per prescription drug, the compound real annual growth rate

26 **Ref.**

27 It should be noted that there is currently concern over the lead time of processing compounds to prescription drugs and also a perceived slowdown in "innovative medical therapies submitted to the FDA for approval". This has led to the FDA seeking to modernize the development/approval process via the Critical Path Initiative. (FDA, "The Critical Path to New Medical Products", March 2006)

28 This is adjusted to year 2000 dollar values, and does not include the cost of capital.

29 Once the costs of post approval clinical trails are included (phase IV), the total cost becomes $897m.

in total costs has been 7.4%. This has been mainly due to increases in costs during the clinical trials (phases I to III), rather than increases in the pre-clinical stage. This is in line with the research of the Pharmaceutical Research and Manufacturers of America (PhRMA) and the Tufts CSDD Approved NCE Database, which together demonstrate that although the number of approved NCE's has been growing since 1963, the amount of R&D expenditure of the pharmaceutical industry (adjusted for inflation) has been growing faster.

As noted below, the pipeline of NCE of a pharmaceutical company is of critical importance, and as such is to be found in the annual/financial reports, and furthermore the sales of individual drugs will also be found in the report. However, and despite contrary claims, cost data on individual drugs in the pipeline are not to be found in the financial reports of large pharmaceutical companies. As already alluded to above, DiMasi et al. (2003) collected cost data on individual drugs (projects) by the use of a "confidential survey" of foreign and US-owned firms. This is also supported by an accountant in the R&D operations of DrugCo:

> "We don't report project costs. We report R&D in our accounts, and we will quote an average cost of developing a drug takes something like whatever billion dollars, but that's over the life of the drug. We wouldn't disclose what costs externally ... I'd almost ask you to, if you get the time, have a look and see if you can find any project costs in any of our external reporting."
>
> (R&D Accountant, 2003)

This underlines the importance of a researcher gaining direct access to pharmaceutical companies if (s)he wishes to investigate the costing systems of pharmaceutical R&D projects. To further test this claim, a search of the Financial Times and Economist was conducted for the years 2000 to 2005 using the key words "Pharmaceuticals", "Project", & "Costs", which did not yield any

information on specific project costs nor their calculation. Finally a search of the ISI Web of Science citation index for the same period did not yield any papers discussing project costs in the pharmaceutical industry, except DiMasi et al. (2003) and an earlier paper by the same authors (DiMasi et al., 2002).

3.6 Differences in Strategy

One of the most obvious features that distinguishes pharmaceutical companies for each other is the range of products they produce and sell. In particular, the mix of prescription to over the counter drugs differs substantially among the large pharmaceutical companies. DrugCo is at one end this spectrum with no over the counter drugs/products, whereas the US Johnson & Johnson earns over 55% of its sales from non-prescription drugs and other consumer products. Indeed, DrugCo appears to be the only large pharmaceuticals company with a pure concentration on the development and manufacture of prescription drugs. It's main UK rival earns approximately 14% of its revenue from sources other than prescription drugs. This difference, as covered in later chapters, is potentially impacted on the internal structures and cost accounting systems used.

Company	% Pharmaceutical Sales
DrugCo	100
Merck	94
Sanofi Aventis	92
Pfizer	86
GlaxoSmithKline	86
Wyeth	82
Bristol-Myers Squibb	79
Novartis	77
Roche	77
Johnson & Johnson	44

Table 1: Pharmaceutical Sales as a Percentage of Total Sales

3.7 Economies & Diseconomies of Scale

The pharmaceuticals industry, especially since the merger/takeover boom that started in the late 90's, which so far that saw mergers between Astra & Zeneca, and Glaxo & SmithKline Beecham, and a hostile takeover of Aventis by Sanofi-Synthelabo[30], faces a perceived difficult paradox in scale economies.

One argument is that the funds necessary to develop and market prescription drugs are increasing to the point where only the biggest companies will be able to afford such activities. Furthermore, the need for an extensive skills base, creates substantial barriers to entry. However, the converse argument is that such large pharmaceutical companies inherently stifle the creative activities necessary to discover new NCEs. At the extreme end is the notion that all research could be outsourced to the smaller biotech companies, with the expensive activities of clinical trials & marketing left to the big pharmaceuticals. Between these two positions is the notion that the pharmaceutical companies are faced with a difficult balancing act.

> "You have to balance the difficulty of managing large numbers of scientists whom you want to be innovative with the technological economies of scale"
>
> (Dr Jonathan Knowles, President of Global Research, Roche)[31]

However, as will be seen later in chapter 6, section 6.11.2, this is a somewhat blinkered view of outsourcing decisions. Instead the pharmaceutical company that is the subject of this research, appears to outsource numerous activities while also maintaining equal capabilities internally. Furthermore, pharmaceutical companies both maintain substantial research operations geared towards discovering new chemical entities, but also buy preclinical NCE's as

30 Gapper, John, "How Big Pharma Stumbled in its Quest for Blockbusters", Financial Times, 16 March 2004, p. 21.

31 Pilling, David, "Revolution Behind Surge in Budgets", Financial Times, 25 June 1999, p. 11.

well. The cancer drug Erbitux, discovered by ImClone[32], has been licenced to Bristol-Myers Squibb for $250m[33]. DrugCo has also entered into acquisitions, licencing,& partnerships. This includes drugs at all three pre-approval phases[34].

3.8 History of DrugCo

DrugCo was formed in 1999 from the merger of the UK based Drug Plc and a foreign pharmaceuticals company. Drug Plc was formed as a de-merger from ChemicalCo, which had a history of pharmaceuticals production dating back to before the Second World War. Interestingly, the company ChemicalCo (Pharmaceuticals) was originally formed as a sales & marketing subsidiary with no manufacturing facilities of its own, but instead selling the produce of ChemicalCo Dyestuffs (transferred at full cost including capital). In 1942 the subsidiary became a separate division of Chemical, with it's own headquarters and it's own research operations. However, it still relied on ChemicalCo Dyestuffs for production until the subsidiary established its own two manufacturing facilities. This demonstrates the importance of sales & marketing in the pharmaceuticals industry from a early age, and which remains to this day. In 2005, R&D expenditure by DrugCo amounted to $3.4bn, whereas selling, general & administrative costs amounted to $8.7bn. A similar story is found in GlaxoSmithKline, where R&D expenditure amounted to £3.1bn, whereas selling, general & administration costs were £7.25bn in the same period. In Pfizer, R&D expenditure was $7.4bn, whereas selling, informational & administrative expenses were $17bn.

3.9 The Pharmaceutical Industry: An Opportunity for Research

In conclusion we have seen that a pharmaceuticals industry makes an important

32 The astute will recognise this as the same company for which Martha Stewart was found guilty of insider trading.

33 In addition ImClone will be paid 39% of revenues. (From Bristol-Myers Squibb Annual Report 2005)

34 For a list of such "externalisations", see DrugCo's Annual Report 2005.

contribution both to the UK economy, balance of payments, and R&D within the UK. The complex and difficult nature of drug development has led to a rise in the cost of drug R&D since the early 90's (if not before then). The costs of prescription drug research and development are substantial, especially when the failure rates and cost of capital are factored in. This means that cost control, early detection of drug failure, and speed of development are importance factors for any pharmaceutical company to monitor. Furthermore, we have seen that the large pharmaceuticals have adopted different strategies, and there are considerable questions over the level of internalisation of the research and development activities. These different strategies nature beg questions regarding the management control systems used in these companies, including the role of the accounting information systems. Why are there differences in strategy? What implications to these different strategies have for internal structures and accounting systems? Yet it has been demonstrated that, from the perspective of management accounting research, information on individual projects and drugs is not available, underlining the need for researchers to "go into" companies to research costing systems. Previous research (Mehafdi, 1990) has suggested that transfer pricing plays a role in pharmaceutical companies. Lastly, questions remain over the granularity of the control systems used within pharmaceutical companies. Emmanuel & Mehafdi (2001) have questioned the implicit assumption of homogeneity of transfer pricing systems within companies by previous studies.

Together, this all suggests the pharmaceuticals industry in the UK is an important part of the UK economy, and furthermore it represents a important and rich area for management accounting research, and especially offers an important opportunity for case research given the need to "go into" companies to uncover the granularity of accounting systems.

Chapter 4 Research Methods

4.1 Methodology & Choice of Method

The previous chapter spent some time discussing the prior research in both the transfer pricing and transaction cost economics literature. A brief summary is included here to highlight the reasons for the particular research methods used in this study. In particular the difficulties of replicating prior studies and theoretical frameworks, and which methods it was hoped would be effective in this study.

4.2 Prior Research Methods

4.2.1 Prior Transfer Pricing Research

Prior transfer pricing literature has tended to use questionnaires, both descriptive and analytical, although descriptive questionnaires seemed to have achieved greater success in publishing. Unfortunately little knowledge seems to have been gained by these questionnaires, resulting in Vancil (1979) lamenting his inability to add much to the knowledge on transfer pricing.

> "My third disappointment in this study is that I have been unable to say anything definitive – or even mildly useful – on the subject of transfer prices ... I wish the best of good fortune to the next researcher to tackle this problem."
>
> (Vancil, 1979, p. 142)

Although case studies have been more rare, and are more of a recent phenomenon, greater success has been gained using this technique. The most notable case studies reflect the frameworks that have informed this study, notably the work by Eccles (1985), Colbert & Spicer (1995), van der Meer-

Kooistra (1994), and van Helden, van der Meer-Kooistra, & Scapens (2001).

One of the most difficult tasks in interpreting prior literature concerns focus, that is the level or levels at which transfer pricing occurs. Eccles' framework operates at the firm level, whereas the frameworks of Spicer and van der Meer-Kooistra operate, as underlines their transaction cost economics (TCE) heritage, at the transaction level. From the perspective of research design this manifests itself by asking what unit of analysis should be the focus of the study? Should individual transactions be measured, or subunits within companies, or whole companies?

Of the previously mentioned case studies, only the second and third of these have attempted to determine variation within the costing systems of their participating companies. However, success appears to have been partial. Variation was found in the participating companies, but not to the degree found in the TCE literature. Instead, the papers tended to outline only a few different transactions for each participating companies. Colbert & Spicer analysed eight transactions in four companies, and van der Meer-Kooistra analysed eleven divisions in four companies. Following on from these previous works, this study intended to measure a larger number of individual transactions within a single company, thus allowing statistical techniques to be employed, similar to those found in studies from the TCE literature.

4.2.2 Prior Transaction Cost Economics Research

Case study research within the transaction cost economics literature has been far more widespread. Although initially a few studies were conducted on multiple industries using financial data, most notably by Levy (1985), their limitations in measuring both the explanatory and dependent variables were noted (Williamson, 1991; Levy, 1985). Instead researchers within economics turned to explanatory case studies, usually in fairly traditional industries, including the coal and car manufacturing industries. Some of the early attempts kept clear of

quantitative measures, but these were soon followed by quantitative analyses to confirm the TCE propositions. These case studies, by focusing on only a few companies, within a single industry, were able to gather specific data on variables that are industry specific. An early example is Monteverde & Teece's (1982) study of the car components in Ford and GM. In particular the studies were successful in measuring dozens of sample points within single companies at the transaction level, allowing statistical techniques to be used. However the tools used to measure asset specificity appear often to be limited to particular industries, and often more traditional heavy industries, rather than services (with the notable exception of the marketing literature's use of TCE).

4.3 The Questionnaire

4.3.1 Aims of the Questionnaire

The original plan of this research was to test the frameworks of Eccles (1985), Spicer (1989), and van der Meer-Kooistra (1994), using a questionnaire and appropriate statistical techniques within a single company.

4.3.2 Design of the Questionnaire

The original aim was to follow the TCE style of research outlined above, by developing and conducting a questionnaire for use within a particular firm. A number of variables from both Eccles' and Spicer's frameworks were to be measured at the transaction level. The questionnaire instruments that were used were generally adapted from previous studies. It was hoped this would improve the likelihood of respondents understanding the questions, and the effectiveness of the questionnaire. Before the questionnaire was piloted amongst DrugCo personnel, it was piloted against members of staff within the accounting & finance department at the University of Glasgow. Concerns were raised over the overall length of the questionnaire and the use of "other" response boxes. There were no concerns over the ability of respondents to answer the questions, rather

it was felt the time required to answer the questionnaire was likely to reduce responses.

Unfortunately when the questionnaire was piloted amongst personnel within the DrugCo, it proved impossible to utilise in its current form. It quickly became evident that the theories and research instruments were not developed sufficiently to complete an explanatory case study. More specifically it became apparent when talking to managers and accountants within the company that the questions did not seem to be understood by or relate to the participants. This came to a head when the chief accountant of R&D, who had already been sent a copy of the questionnaire, said that he would have difficulty answering the questions[35]. Even in the flexible environment of the interview it proved difficult to measure certain variables. This in turn suggested that a number of the concepts behind the questions did not relate well to the respondents, and that a better understanding of the concepts, more particularly an understanding of how the concepts translate into the world of the respondents was required. Therefore this study changed course to explore the concepts outlined by the frameworks, in other words the study changed from an explanatory mode to an exploratory mode. It also became evident that the extent of variation required for the statistical methods did not exist, that is three embedded units where found, rather than the twenty or more required for the simplest of statistical techiques.. Instead, as is explored in greater depth in later chapters, three different organisations become apparent, with three different accounting systems.

Ultimately there was a switch from the pilot sessions with accountants and managers to interviews. The conclusion was made that the style of research conducted so successfully in the transaction cost economics literature could not be applied to the complexity of intra-DrugCo transactions found in the DrugCo. At this stage there was a growing appreciation that no universal transfer pricing

35 This was the fifth interview, although a widening of the questions to a more exploratory mode had already occurred by the fourth interview, as evidenced by the increase in the interview time from half an hour to three quarters of an hour between the third and fourth interviews.

or cost allocation system covered all DrugCo internal transactions. Different subunits within the DrugCo operate differently.

4.4 The Case Study

4.4.1 The Aims of Case Study Research and Research Question

Due to the inappropriateness of the questionnaire, the aim of the study changed rather dramatically. Instead of testing the Eccles and Spicer frameworks at the transaction level, the study found itself with two chief aims. Firstly, as noted above, exploration of the concepts in those frameworks was required. The techniques of the grounded theory appear appropriate for an exploratory style of research where concepts need development. Secondly it was hoped that current theories could be extended.

The original research question was to provide some evidence of the validity of the current transfer pricing frameworks, but this has turned towards an exploratory piece of research. Thus the current research question asks what factors explain differences in the use of cost allocation within a large pharmaceutical company. The research has turned towards the grounded theory of Strauss & Corbin (1998).

4.4.2 The Use of Prior Theory with Ground Theory

The grounded theory approach to theory generation is well developed, and has seen numerous variations on the original scheme. Although grounded theory was originally designed for developing theories with little or no influence from previous theories, one of the most obvious developments has been the varied use of prior theories to inform the use of grounded theory in case studies (Locke, 2001). The use of prior theories and research is the focus of much variation in grounded theory research. Exactly how sensitive to prior theory a researcher should be is problematic. Too much influence is likely to lead to the researcher

being blinded to data given by interviewees. Locke (2001, p. 89) for instance states:

> "researchers do not introduce to their analysis specific concepts or propositions, and when these do come to mind as analysts name and compare their data fragments, they temporarily bracket them out."

Rennie (2000) notes the use of "bracketing", the self-analysing of the researcher's own biases, to eliminate or at least control for them in the analysis of the data. However the researcher should not be blind to prior research, that is he or she should be "theoretically sensitive", since prior research, especially if it has been grounded or successfully tested in prior case studies, is likely to have relevance to those cases under study. Ignoring such previous research is likely to result in the researcher failing to notice data that fits with those prior theories or the researcher may end up reinventing those prior theories. Miles & Huberman (1994) seem to suggest the use of a coding scheme developed prior to the data gathering, a "start list", partly based on prior literature. Eisenhardt (1989) also advocates the use of prior theory to guide the framing of the research problem. However both note the danger of "forcing" the data, and Eisenhardt suggests that researchers should "avoid thinking about specific relationships between variables and theories as much as possible". Thus the researcher has a balancing act to perform, albeit a rather difficult one. Achieving "bracketing" and "theoretical sensitivity" at the same time can appear to be a tall order.

A researcher can struggle with the use of prior theory, despite its predominance in previous TCE literatures. One question in particular arises: Is the research forcing the data collected to fit the theory? Or put more simply, is the square block being hammered into the round hole?

Two rules of thumb to help the researcher not be overly influenced by prior theories became evident when conducting the analysis of the interviewees'

transcripts. Firstly the researcher should at certain times in the research totally ignore the prior theories, they should look only to ideas emerging from the data. This should not be done at all times of the research, indeed at other times looking for prior theories in the data should also be done, but time should be set aside for developing purely grounded theories. The second rule of thumb is when the researcher considers prior theory. The question the researcher must ask themselves continually when they find data that fits with prior theory, is whether they feel that they are fitting the data to theories inappropriately. The researcher needs to stand back, and question whether they are "fitting the round circle into the square hole". These rules of thumb can be applied to all three levels of coding, even selective coding, where innovative relationships should be looked for, and a priori relationships questioned.

The converse worry is that the researcher is wrongly ignoring important extant theory. The danger the researcher must be open to is "reinventing the wheel", uncovering concepts and hypotheses that have already been added to the literature. While confirmation of prior literature would be gained by such an exercise, a significant amount of time and effort would have been used to arrive at a conclusion that would have been achieved more easily if prior concepts and theory had been recognised earlier. There is also a fear that the researcher will reinvent the wheel without realising it at all, therefore running the risk of accusations of plagiarism.

However an alternate way is possible. By explicitly considering theorised concepts and relationships, the explanatory power of the theory, or rather the lack thereof, can be explored. In other words, the researcher can look for extensions to the current theories, look for flaws in the current theory, and look for competing & alternative explanations. Thus an interactive method of research is used where the researcher iterates between data, current theory, and new theory, identifying instances where the data supports the predictions of current theory, and instances where explanation requires new theory. Another reason for considering current theories is, as explained above, they are somewhat

incomplete, especially as regards operational measures. New interpretations of current concepts can be identified, especially interpretations that fit with the experiences & perspectives of interviewees. Thirdly a number of the explanatory variables identified by the current theories are not much in doubt, that is to say there is sufficient prior research to suggest the variables do exist. Some of the critiques of TCE have focused not on the unimportance of asset specificity, but rather on the causal relationships between different types of asset specificity and numerous dependent variables (see Ghoshal & Moran (1996) for one example). Hopefully some light may be shone on this problem.

Given the original aims of this study, the version of grounded theory adopted was not the purest of forms. One of the reasons for adopting the exploratory techniques of grounded theory was to uncover the interviewee's interpretations, experiences, & understanding of given concepts. Thus the given concepts from the frameworks have guided the questioning and interpretations of the interviews. Nevertheless the danger of over forcing the data to fit the hypothesis of the frameworks has been avoided by use of the rules of thumb above.

4.4.3 Exploratory versus Explanatory Research

It is important to stress that this study has turned into a piece of exploratory work. Yin (2003) distinguishes between exploratory and explanatory case studies by defining exploratory case studies as "aimed at defining the questions and hypotheses of a subsequent study ... or at determining the feasibility of the desired research procedures", and explanatory case studies as "present(ing) data bearing on cause-effect relationships"[36]. Essentially this means this study has shifted from testing frameworks, to developing concepts & hypotheses. However, the distinction between the two is, despite the stark differences implied above, problematic. This point has been made by other researchers:

36 Yin (2003), p. 5.

> "the distinction between exploration & explanation is rather ambiguous"
>
> (Ryan, Scapens, & Theobald, 2002, p.144)

The reasons that the two types of case study blur is that explanatory research easily turns into exploratory, and vice versa, and indeed this should be the case most of the time. The environment of the case study gives the researcher opportunities that the quantitative researcher is usually denied. In the course of testing hypotheses the chances are that a perfect fit will not be achieved, especially in early research. The explanatory case study environment usually allows the researcher the opportunity to explore the reasons behind instances where hypotheses' predictions fail to match cases, whereas the quantitative researcher will often be left to theorise to explain the failure. The case study researcher can more readily develop new or altered theories that are grounded in the data.

The researcher conducting exploratory research, especially following grounded theory, will also find him or herself naturally straying, to some extent, into explanatory research. This is due to the need to judge the fit of any emerging concepts and linkages with new case data. Pattern matching techniques can be used for both theory development and theory testing. Therefore the practicalities mean the case study researcher is likely to find him or herself, to some extent, conducting both types of research.

Eventually it is hoped that the researcher will, through an iterative process of testing and development over multiple case studies, reach a point where no more development is required, where additional cases fit with the emerging theory, the point of theoretical saturation. We have discussed this distinction to underline the place where this study fits into the spectrum. This study should be seen as early exploratory research since the links between the competing theories are

still unknown, and the concepts are poorly understood at those places. Although this is primarily an exploratory case study, some pattern matching is conducted with a few matrices.

Again, it may be a dangerous simplification of the distinction between explanatory and exploratory research, but the former is seen as belonging to the positivistic school of research, while the latter is seen as belonging to the interpretative and naturalism schools. However, even Yin, who would perhaps be placed within the positivistic school, advocates the use of the exploratory case study to determine incidents, operational measures, and conceptual frameworks. (Yin, 2003, pp.6-8) In reflection, one might argue this has been the path taken by the marketing research that utilises transaction cost economics. Palay (1985), in what was one of the first papers to cover the importance of sales agents, conducted exploratory research into the importance of TCE within the transportation industry in the US. Later papers, most notably those published by Heide[37], have used psychometric style questionnaires and structural equation models. In other words the marketing literature has followed the hierarchical mode of research noted by Yin (2003), where case study research is seen as solely for exploratory research, whereas the testing of theory is to be achieved by quantitative research. Yin himself is highly critical of the hierarchical view of research, for its relegation of case study research to only the exploratory stage of research. This author agrees that while the hierarchical model is overly narrow in its view of case study research, the use of exploratory case studies in new areas of research is valuable, as demonstrated by the marketing literature, and indeed Yin advocates the use of pilot studies prior to more extensive explanatory studies. In addition, Strauss & Corbin (1998) note the Lazerfeld & Wagner's (1958) recommendation of exploratory research at the beginning of new research.

37 See Rindfleisch & Heide (1997) for a review of the marketing literature.

4.5 Field Work

4.5.1 The Organisation

The organisation at the centre of this study was chosen for a number of reasons. The first is simply pragmatic; the author believed he had a good chance of gaining access through contacts (which proved to be true). The second reason was the industry of the organisation, namely pharmaceuticals. It was believed from prior research (Mehafdi, 1990) and from discussions with the supervisor, that such companies within the pharmaceuticals industry had considerable transfer pricing issues and instances. While this did not prove to be entirely accurate, it is clear that the DrugCo has interesting systems which current transfer pricing theory may say something about, and more importantly the DrugCo's cost systems may enlighten current theory. Thirdly the DrugCo represents a successful organisation[38]. Lastly the DrugCo has a considerable amount of its operations within the UK, thus allowing fairly in depth analysis from within the UK. The main source of data was interviews and the corresponding transcripts, although the DrugCo annual reports were also used.

4.5.2 Access to Interviewees & Sample Selection

Access was achieved through contact with the senior accountant and senior tax accountant of the DrugCo headquarters. With their help potential interviewees were identified, these interviewees being senior accountants within four subunits within the DrugCo. From these accountants further interviews were organised with senior managers (non-accountants) within the four subunits. Thus an evolutionary approach to sample selection was adopted. This was however guided by the need for theoretical sampling and more generally triangulation. There were two main aims to the sampling. Firstly to provide a certain level of triangulation of data sources to achieve validity to findings. Secondly to find

38 Although DrugCo's market value declined by 43% from 2000 to 2002 , it has since increased by 56% (figured derived from Datastream).

variance in the accounting systems and explanatory variables in the organisation.

Individuals with different roles (accountants and non-accountants), and within different organisations (research, development, manufacturing, and sales), levels (corporate and subunit), & locations were selected. The difference between the subunits within DrugCo was outlined as an important area for investigation, and the selection of interviewees from all four was an important decision. In addition, the level of analysis appears to be important, and interviewing individuals from different levels within the hierarchy demonstrated the differences in strategy between levels. On reflection, it is obvious that a clear understanding of the structure is required for qualitative research into this area of management accounting research, far beyond Eccles' simple definition of two variables, namely, vertical integration and diversification.

4.5.3 Interviews

The initial questions used in the interviews originated from prior literature, including the three frameworks mentioned above, and research conducted in both the transfer pricing literature and the transaction cost economics literature. In practical terms this meant that the questionnaire was used as the initial source of the questions used in interviews, although these where added to during interviews and also extended as the research progressed to include new questions.

Most of the interviews were recorded and transcribed. While some researchers commented on the likelihood of tape-recorders to influence the interview, this researcher got no impression that interviewees were particularly influenced, and validation techniques should go some way to judging this problem's importance. The author did also take notes during the interviews, but did notice the difficulty in taking notes and considering the interviewee's responses at the same time. The conclusion was, consideration of responses and consequently the next questions were more important than taking notes. However the author also

recognised that audio recordings do not capture everything, including diagrams drawn by some of the interviewees, and the researchers own impressions & thoughts.

Interviews were semi-structured with a set list of open questions originally derived from the questionnaire, but as alluded to above, the researcher did diverge from or add to the questions to further investigate areas of interest. This ultimately led to an increase in the list of questions for interviews, as might be expected with an exploratory mode of research.

This leads to a problem with comparability and triangulation, since new questions will uncover new data that is not immediately comparable with any data collected in previous interviews, thus the validity of concepts derived from later interviews is potentially lower due to the smaller amount of data and triangulation. However it has been possible with a number of concepts, especially axial codes, to uncover enough evidence, although not immediately comparable, which nevertheless allow concepts to be developed that are grounded in the evidence, that is there is enough evidence to justify the new concept, adding a measure of construct validity to the concepts.

The use of a list of questions, a copy of which was given to the interviewees' at the beginning of the interview, added a measure of reliability to the case study. Transcribing and initial analysis focused on whether the interviews were successfully uncovering information on the various concepts originally proposed to be measured in the questionnaire and those concepts that began to emerge from the interviews. The PhD's supervisor reviewed copies of the interview transcripts, and gave an independent interpretation that the interviews increasingly "hit the mark".

Most of the interviews were individual, although one involved two interviewees at once (fifth interview). In addition it has been noted by researchers that retaining control over interviews is important. Hammersley & Atkinson (1995)

note, by reference to one of their own rather unique experiences (p. 149), that it is important for the researcher to retain a certain amount of control over the interviews. This author feels that on most occasions this was achieved, although it must be noted that the DrugCo is primarily a research organisation, and thus the employees of the DrugCo, especially senior management have considerable experience of research and hearing about peoples' research, and on one occasion this author found the interviewee gaining control.

Date	**Organisation**	**Accountant/ Non-Accountant**	**Length**	**Recorded**
18/6/02	Centre	Accountant	1½ hrs.	No
9/7/02	Sales & Marketing	Accountant	N/A	No
22/7/02	Sales & Marketing	Accountant	½ hour	Yes
6/11/02	Development	Non-Accountant	¾ hour	Yes
21/11/02	Production	Accountant & Supply Chain Team Member	¾ hour	Yes
5/12/02	Research & Development	Accountant	¾ hour	Yes
24/1/03	Research	Non-Accountant	¾ hour	Yes
24/1/03	Development	Non-Accountant	¾ hour	Yes
5/9/03	Development	Non-Accountant	1 hour	Yes
2/12/03	Research & Development	Accountant	1 hour	Yes

Table 4.1: Interviews

A certain level of triangulation has been achieved by interviewing individuals from different parts of the organisation and with different professional backgrounds. In particular five accountants, of which two where senior accountants at the head office, one from sales & marketing, one from production, and one from research & development, and four non-accountants (mainly managers), of which one was from production, two from development, and one from research. This triangulation improves the construct validity of the study.

4.6 Analysis

4.6.1 Grounded Theory & Case Studies

Grounded theory has become a popular means of qualitative research. The techniques developed around the use of grounded theory, including comparative techniques such as the "flip-flop" technique and matrices, theory building tools such as conceptual diagrams, and modern qualitative software. Strauss & Corbin (1998) outline 3 main stages within the life of a case study, open coding, axial coding, and selective coding. This progressive, but iterative method of building up theory helps establish a measure of reliability and construct validity.

4.6.1.1 Open Coding

The first stage of grounded theory is open coding, the generation of relatively low-level concepts of interest, and then collapsing these into a smaller number of categories, composed of a number of properties and dimensions. Coding and generating memos based on microanalysis of transcripts and field notes, and from comparison between interviews primarily achieve this.

Strauss & Corbin provide a number of tools for the microanalysis of transcriptions & field notes, including the creation of multiple interpretations. Interpretations take time to develop, and include a combination of interpretations from different theoretical viewpoints, and from listening to the respondent's language carefully. The latter is hard to achieve in particular, and it was found that time is required to appreciate what interviewees' are actually saying. It is more than a case of using in-vivo[39] codes, but more importantly realising the relevance of concepts given by respondents, and how the concepts relate to the overall system of concepts being developed. For instance, it was a long time before this researcher noticed the importance of the concepts of "relative" and

39 The reader should note that in-vivo coding refers to the use of the interviewee's own words to name codes. NVivo, on the other hand, is a piece of qualitative software published by QSR International. The reader should be careful not to confuse the two.

"absolute" performance measures, despite three different individuals explicitly ranking the importance of cost as a performance measure.

The particular danger that was found is dismissing a concept given by a respondent as being peripheral to the overall system. Ultimately it was found that it is best to ensure all data is coded, if necessary with in-vivo codes, and if an in-vivo code is not later merged with or made a child of another later code, it is unwise to delete that code, but instead place it to the side, for instance in a collection of unused codes, so that the code is available for possible later analysis. For instance, there was a suggestion in the interviewees that the company uses data warehousing software for the costing data in development. At the time, the relevance of this information was uncertain, but nevertheless seemed promising and therefore a free code called "Data Warehouse" was created, referencing the two relevant quotations. This code remained unconnected with any other codes in the developing hierarchy of codes.

Furthermore the researcher should be open to understanding the problems that the interviewee, in particular the manager, faces, and in the case of accounting research, how the accounting helps or hinders the manager. As an example the comparative problems identified with the use of outside sources versus inside sources corresponded well with the transaction cost economics literature. In particular, temporal asset specificity was greatly illuminated by this data, as discussed further in section 5.7. It may be beneficial for future research to take a more blunt approach, namely to directly enquire into the numerous and different problems faced by each manager.

In addition to multiple viewpoints, Strauss & Corbin recommend the use of several comparative techniques. Firstly comparison of incidents along different dimensions was conducted, including analysis by role (accountant vs. non-accountant), and organisation (research vs. development vs. manufacturing vs. sales). Secondly theoretical comparisons, including the "flip-flop" technique, where properties and dimensions are developed by considering their extreme

values, "close-in" comparisons with similar concepts, and finally "far-out" comparisons with radically different concepts.

The use of modern qualitative software is where the robustness of the open coding process is most obviously improved by those applications. The software helped organise the data collected and concepts developed during the research. In particular NVivo 2.0, a descendent of the better-known NuDist software, was used to code sections (usually sentences and paragraphs) of the interview transcripts, organise codes into hierarchies, generate diagrams and matrices, and generally organise data. Essentially the software helps create a database mapped to conceptual constructs, which improves the reliability of the research. In quick summary setting up the data within the software is easily & quickly done, provided one already knows the software. Previous researchers (Williamson, 2001) noted that creating codes was problematical in NuDist, but this author found no difficultly in creating new codes in NVivo, or later Atlas.ti. However, the software has its disadvantages. NVivo's facility for recording memos is poor, in particular there is no way to directly attach comments to any code created, which in turn actively discourages the creation of memos. Secondly, the codes are kept in a hierarchy. While it is natural for computer programmers to use hierarchies, the concepts that the qualitative research works with do not easily fit into a hierarchy, but rather more novel structures often result requiring more flexible software. At a late stage in the research, a switch was made to Atlas.ti 5, which proved to overcome these two deficiencies of NVivo. Atlas provides for quite a rich array of comments and memos to be created, and secondly, the codes created are primarily organised diagrammatically rather than via a hierarchical system[40].

The process of open coding was easily achieved, and the researcher generally found it best to create new codes when needed, leaving consolidation of the new codes into categories to a separate stage. Therefore an iterative process was

40 There is however the "Code Forest" tool, which allows the user to view the codes in a hierarchical structure.

adopted with new coding, followed by consolidation into categories, and then back to further coding, where either new codes where created or further evidence added to the old codes which had become subcategories of the categories of the study.

4.6.1.1.1 An Example of Open Coding

As an example of open coding, we shall look at the code "flexibility". This is a particularly grounded code in that it links to 14 direct quotations. Illustration 4.1, shows the actual coding of the first quotation, where the quotation is the left hand window and the thin vertical bar in the right hand window represents the amount of text related to the quotation. The thin vertical bar has a list of different codes that are currently linked to this quotation, the second of which is the code "flexibility".

Atlas.ti allows all the quotations linked to a particular code to be printed to a document. In particular it shows all 14 quotations for the code, along with the name of the source document (in this case the name of the interviewee), the paragraph numbers, the other codes linked to the quotation, memos linked to the quotation, the finally quotation itself along with the comments attached to the quotation.

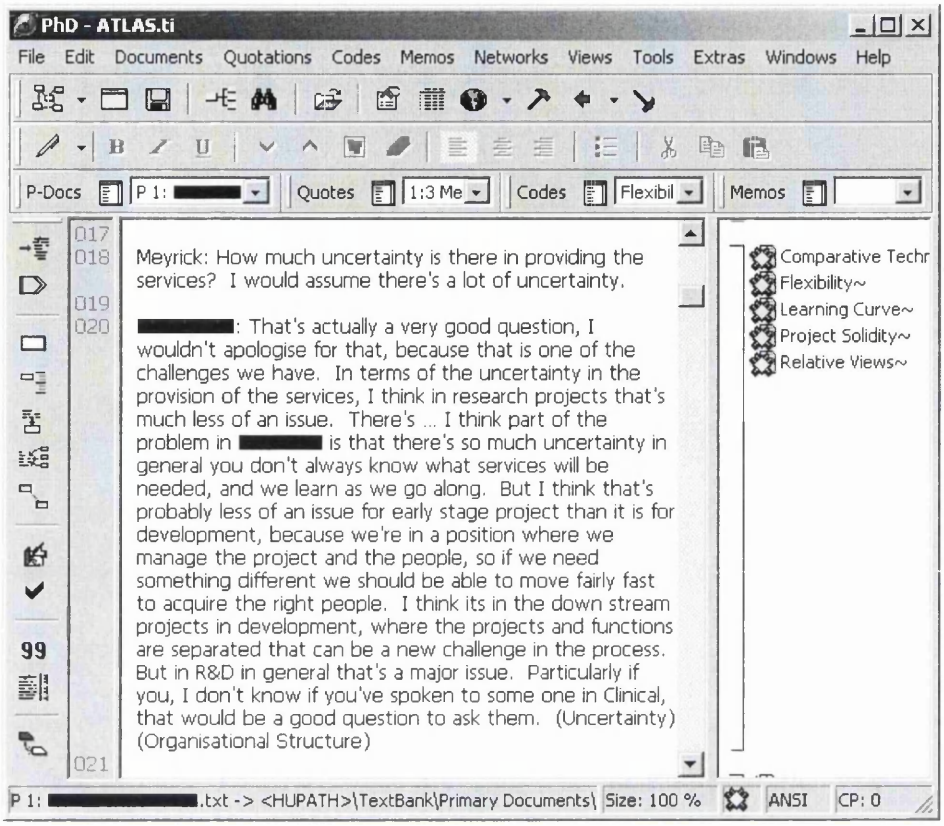

Illustration 4.1: Primary Document Pane

Illustration 4.2 shows the first quotation for the "Flexibility" code, by a senior manager in research. Clearly the context is discussing the uncertainty that his part of the company faces.

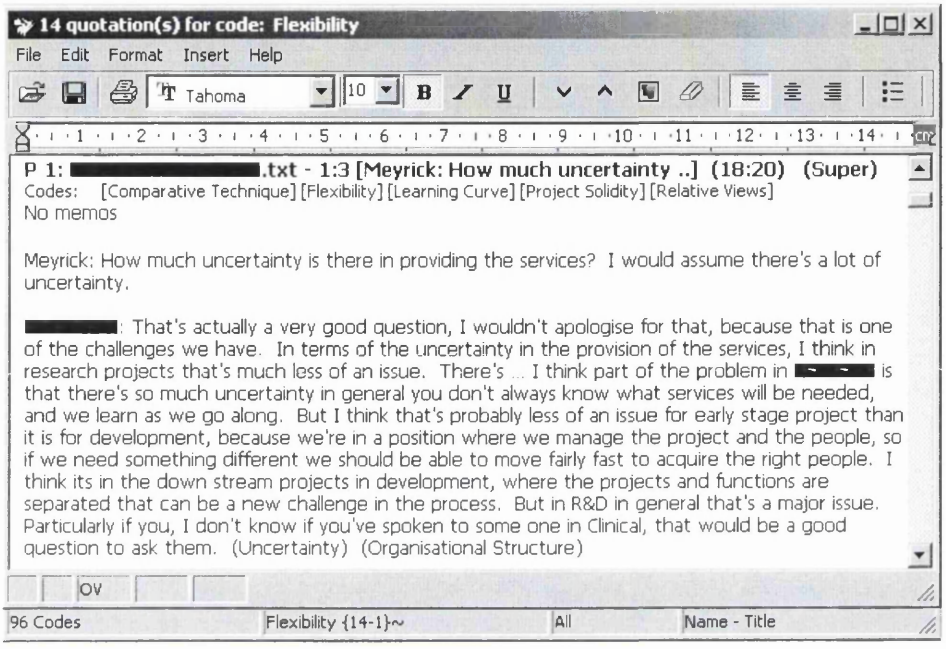

Illustration 4.2: "Flexibility" Code Quotation

And more clearly:

> "I think part of the problem (in research) is that there's so much uncertainty in general you don't always know what services will be needed, and we learn as we go along. But I think that's probably less of an issue for early stage project than it is for development, because we're in a position where we manage the project and the people, so if we need something different we should be able to move fairly fast to acquire the right people. I think its in the down stream projects in development, where the projects and functions are separated that can be a new challenge in the process."

As with good responses, the passage contains information that indicates a number of different codes, and indeed this passage has been linked to "comparative technique" & "relative views", "learning curve", and "project solidity". We can see the manager actually making comparisons himself, in this case between research and development, which is why prompting interviewees to make comparisons is a good interview technique for researchers. This also suggests that measurements should be made relative to other real world examples/cases, rather than predefined absolute norms. In this example the manager was asked about the level of uncertainty without reference to a standard, and chose a relative position himself. We also see hints towards the learning curves that researchers go through with new projects. Lastly the high level of uncertainty suggests a need for the organisation to be able to move quickly to cover unexpected requirements.

Leaving aside these numerous other open codes that the quotation is relevant to, we see the manager noting how the flexibility of personnel in his part of the organisation is preferable for the types of work conducted there, whereas the matrix structure found in development is perceived to be less flexible, and thus not appropriate for research. In the comments section for the code, which is directly editable from the Code Manager (see illustration 4.3), the researcher has written a comment for this code:

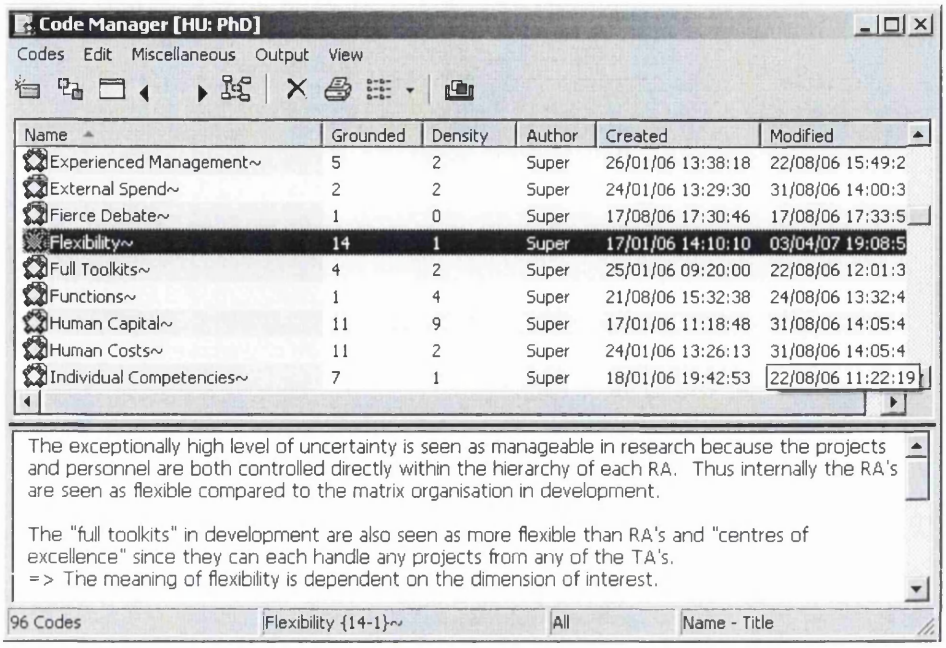

Illustration 4.3: Code Manager

And more clearly:

> The exceptionally high level of uncertainty is seen as manageable in research because the projects and personnel are both controlled directly within the hierarchy of each RA. Thus internally the RA's are seen as flexible compared to the matrix organisation in development.

The next quotation comes from a manager in development.

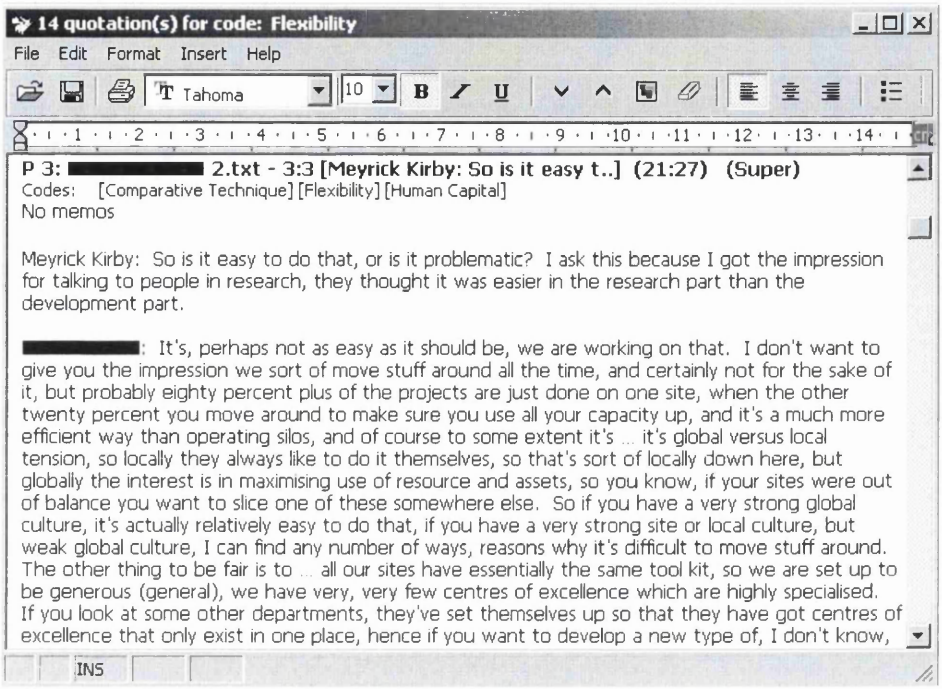

Illustration 4.4: "Flexibility" Code Quotations

And more clearly:

> It's, perhaps not as easy as it should be, we are working on that. I don't want to give you the impression we sort of move stuff around all the time, and certainly not for the sake of it, but probably eighty percent plus of the projects are just done on one site, when the other twenty percent you move around to make sure you use all your capacity up, and it's a much more efficient way than operating silos, and of course to some extent it's ... it's global versus local tension, so locally they always like to do it themselves, so that's sort of locally down here, but globally the interest is in maximising use of resource and assets, so you know, if your sites were out of balance you want to slice one of these somewhere else ... all our sites have essentially the same tool kit,

> so we are set up to be (general), we have very, very few centres of excellence which are highly specialised. If you look at some other departments, they've set themselves up so that they have got centres of excellence that only exist in one place.

This makes an interesting contrast to the previous quotation. Again we see information that is not only relevant to flexibility in that the manager is also making comparisons to other parts of the company. In this case, other, unnamed functions within development. As regards flexibility, the manager is stating the opinion that operating "full toolkits" compared to "centres of excellence" means that his department is more flexible.

First of all it demonstrates a danger in interviewing managers, in that they will tend to perceive their own modes of operation as preferable to other modes. Bearing this caveat in mind, we can still make some interesting conclusions. The manager is saying tasks can be easily moved from site to site, since each site has the necessary skills to undertake the work that his function undertakes.

What we begin to see here is a rather interesting example of the complexity of a concept such as flexibility. Both managers feel that their personnel are flexible enough to move between the different projects being undertaken in their part of the company. However, the first unit covers only projects across a certain range of diseases but has staff to supply all the technical skills required to research chemical compounds. The second covers all the diseases that the company covers, but is restrained to a narrower set of skills. Thus we see flexibility must be viewed from the perspective of the skills required. Therefore we can say there are two different types of flexibility, the flexibility of the staff across difference diseases and the flexibility of staff across different skills. This train of thought is recorded in the comments of the code (see illustration 4.3):

> The "full toolkits" in development are also seen as more flexible than RA's and "centres of excellence" since they can each handle

any projects from any of the TA's. => The meaning of flexibility is dependent on the dimension of interest.

This train of conceptual development continues with all 14 direct quotations.

4.6.1.2 Axial Coding

The second stage is axial coding that refers to the development of relationships between categories (main concepts) based on the properties and dimensions[41] of the categories. Conceptual diagrams were used extensively to build up ideas of the dimensions & properties of categories and also to relate categories to each other. The diagrammatic capabilities of both NVivo 2 and Atlas.ti 5 were used to help build up these diagrams from the concepts uncovered in the open coding stage and from the associated raw data.

The matrices of Miles & Huberman were also drawn upon to assist with the axial coding. Miles & Huberman lay out a number of different matrices for ordering and comparing codes and coded sections. In particular this author has made use of the conceptual matrix to order open codes relative to theoretically derived potential axial codes. It should also be noted that some of the axial codes were derived a priori from previous literature, while others from the data, in-line with the notion of applying theoretical sensitivity. Role-ordered matrices that order open codes against different respondents, and by extension different units within the DrugCo were used.

It should be noted that while the use of matrices is very useful, especially for organising data and concepts both on paper (or electronic paper) and also in the researchers mind, axial codes do not jump straight out of matrices. Indeed the

41 There is a certain amount of ambiguity over the difference between what constitutes a property, and what constitutes a dimension. For the purposes of this research, a property is defined as a distinguishing part of a axial code, that can have a value placed upon it. A dimension is defined as a type of property that can have a value placed upon it from among a logical list if values, in essence an ordinal ranking.

experience of this researcher is that for many axial codes, their respective properties and dimensions were identified away from the matrices, that is the researcher identified properties and dimensions when reflecting upon the matrices outside of the office. Matrices proved more useful in later stages to achieve some form of validation of the relationships. By validation, it is not meant testing in the quantitative sense of testing that the developed theory is representative of some population, but rather to check that the categories are grounded in the raw data.

NVivo can produce search results in the form of a matrix with cells grounded in the data, although this author had to turn to certain work-arounds to create satisfactory matrices[42]. However the software does not allow the Miles & Huberman style matrices to be created because values cannot be attached to cells in the Miles & Huberman style, which greatly reduces the utility of the matrices.

It is surprising that there exists no software, to this researcher's knowledge, that adequately helps achieve this task of producing matrices, in particular where the cell entries in the matrix are related back to their original quotations, a surprising situation given the supposed popularity of matrices. However, since this is an exploratory piece of research, and matrices are primarily used for pattern matching in explanatory case research, this was not a major problem.

4.6.1.2.1 Axial Coding in Practice

This process of axial coding refers to building up the numerous open codes into larger categories or axial codes, and by extension determining the properties and dimensions of the axial codes. The network diagrams available in NVivo & Atlas.ti are both useful, but the ability to display the comments for the codes in Altas.ti is particularly useful. Expanding on the example above, flexibility can

42 Creating a code for each interviewee, then assigning whole interviews to those codes, and then performing a search with the interviewee codes against the conceptual codes can create matrices where columns are categorised by interviewee and rows by those concepts of interest.

be, as discussed later in chapter 5 and 6, used as one of the measures of human capital. To be more precise, the inflexibility of persons, teams, etc., suggest that they are specific to certain disciplines or disease areas. Appendix D contains the final network diagrams produced by the thesis. The capital diagram in appendix D shows flexibility as one of the properties of human capital.

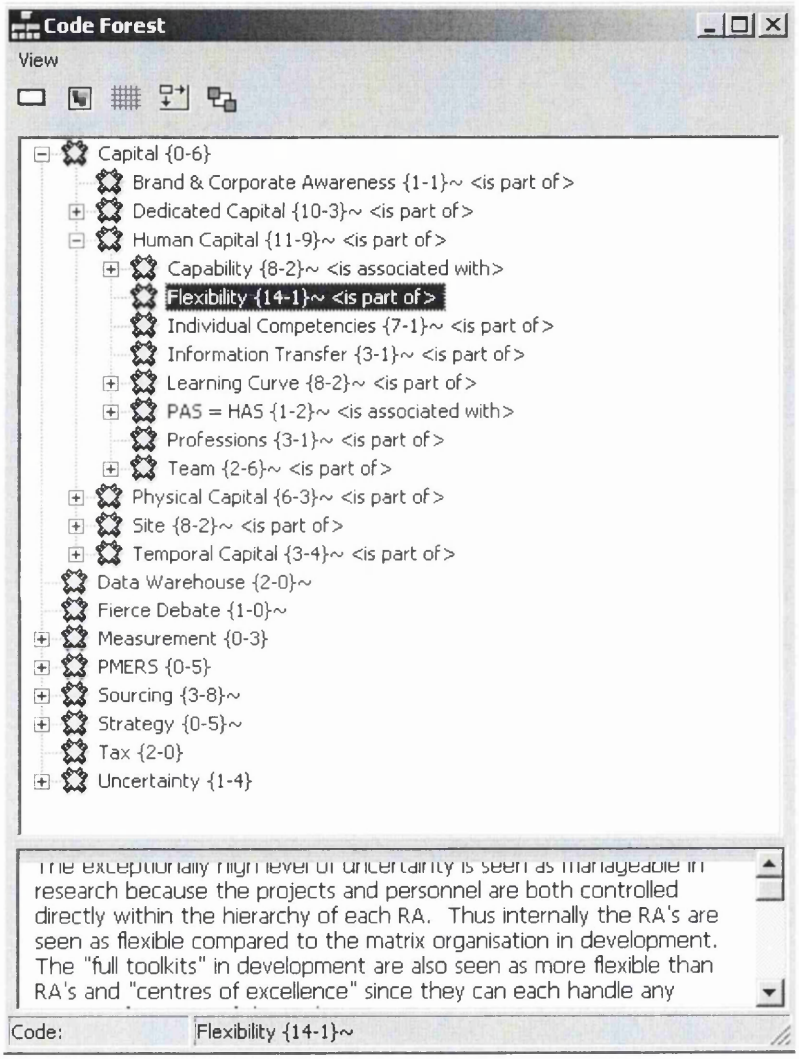

Illustration 4.5: Code Forest

However, other open codes also relate to human capital. For instance "learning curve"s are mentioned by managers, suggesting investment in human capital specific to projects, etc., and also shown in the flexibility open code. "Team" is

also an important code that demonstrates a way in which to measure human capital and human asset specificity. Thus diagrammatically these are linked to "human capital" using the "part of" association. This means that the codes "flexibility", "learning curve", & "team", are direct child codes of human capital. This is again shown in the capital diagram in appendix D and also the "Code Forest" in Atlas.ti (see illustration 4.5).

Underlying the flexibility of the Atlas.ti software, the distinction between open codes and axial codes is somewhat blurred. Firstly, the code forest demonstrates that the researcher is not constrained to two levels of coding, axial(parent) and open(child), rather numerous levels can be created. Thus the position of codes that are neither at the top nor the bottom of the forest/hierarchy are somewhat ambiguous. Secondly, all the codes can be linked to quotations, therefore axial codes themselves can be linked (grounded) directly to raw data. However this aids in pushing data from axial codes down to open codes, in other words quotations linked to the axial code can form the basis for creating new open codes to which the quotations are linked. However some of this ambiguity demonstrates the iterative process of coding that occurs, as the researcher moves between developing axial codes, to developing open codes, and so on.

This does leave open the question as to whether the links between the quotations and the axial code should then be removed. In the end it was decided to leave such links, especially since the facility for outputting the quotations linked to a code includes the names of all codes linked to a quotation.

Because the quotations output linked the name of the source of a quotation, and since the researcher knows to which part of the company each interviewee belongs, comparisons between units is easy to conduct, and again the results of such comparisons are noted in the comments of the code.

Modern qualitative software, judging from NVivo and Atlas.ti, is currently poor at creating matrices of the type outlined in Miles & Huberman. In the end only a

few matrices were used, primary to further investigate & demonstrate the differences in certain axial codes among the different organisations within DrugCo. These are shown in chapter 8 as tables 8.1 and 8.2.

4.6.1.3 Selective Coding

The third stage of grounded theory, selective coding, aims to achieve the scientific aim of parsimony, that is to reduce the theory to a few simple categories by the selection of a core category of the research, and finalisation of the research around this core category. This proved to be difficult until this researcher struck on the use of the stories, in particular four stories that placed the axial codes in a narrative outlining the associations between the axial codes. This in turn allowed a set of hypotheses to be developed from the stories in an overall framework.

Unfortunately this process proved impossible to complete in this particular case study. In particular, as discussed later in section 8.4.4, two competing explanations arose to explain the use, or lack thereof, of cost allocation to projects. This in turn, means a complete cycle of selective coding is impossible. It might be argued that further evidence from the case might have been collected to eliminate one of the possibilities, but the nature of the disagreement precludes that possibility. As discussed further in section 8.4.4, the most obvious way to attempt to eliminate one of the possibilities is to move onto a new case, which is outside the remit of this piece of research.

4.6.1.4 Summary of Coding Processes

While these three stages are outlined, it should be noted that this is very much an iterative process, moving between data gathering, open, axial, selective coding, and current theory. In all three stages, the use of prior theory was used, where new codes, axial codes, linkages, stories, and hypotheses were compared to current concepts and theories, which in turn formed the basis for further coding.

However, as noted before, in-vivo coding and analysis directly focused on uncovering purely grounded codes & linkages, was performed during each stage.

In addition the process should generalise from the specifics of the case to theoretical abstraction, such that the core category of the selective coding stage and the surrounding network should be applicable to more than the cases studied. There are questions over the degree to which this can be achieved within a single study:

> "Another weakness is that building theory from cases may result in narrow and idiosyncratic theory."
>
> (Eisenhardt, 1989, p. 547)

To overcome this the researcher needs to identify those elements that appear applicable to other cases, and to suggest what those other cases may be. That is the researcher is attempting to generate theory that is applicable to other situations, what Yin (2003) calls "analytical generalization". Yin describes with references to Jane Jacob's research into urban planning based on mainly experiences in New York:

> "Jacob's book created heated controversy in the planning profession. As a partial result, new empirical inquiries were made in other locales to examine one or another facet or her rich and provocative ideas. Her theory, in essence, became the vehicle for examining other cases, and the theory still stands as a significant contribution to the field of urban planning."[43]
>
> (Yin, 2003, p. 38)

Therefore the theories generated by case study work provide the basis for

43 Italics in original source.

replication to other cases, based upon the context and variables identified in the original case study. Therefore the generation and refinement of theory, along with an appreciation of the context of the case study and notes for future replication, provide for the external validity of the case study. This researcher has come to recognise that this case does represent an organisation with considerable (to say the least) experience in project management, including the use of outside sources. Similarities have been seen between the problems identified by the organisational interviewees' and this researcher's own observations of project outsourcing within his home institution. Thus the hypotheses developed from this case may be applicable to service companies, especially those that supply products derived around long-term projects[44].

The process of grounded theory is finished when theoretical saturation is achieved. This appears to be generally defined as when no further theory can be developed from new data gathering, although it has also been suggested that the process is finished when the researcher runs out of time &/or resources.

4.6.2 Dangers & Limitations

In addition to direct analytical techniques, a number of dangers in qualitative research have been identified, as well as potential solutions to those dangers. Firstly, the author needs to ensure the developed theories are grounded in the data, in other words, concepts need to be related to data from which they were derived or to which they relate. While the research conducted by this researcher made considerable use of prior literature, it is recognised that concepts developed during the research must reference the data within the case from which it derives. Modern software helps ensure that concepts can be related back to their original quotations from interview transcripts, thus providing some assurance to the "groundedness" of the concepts.

Although case study research, especially single case studies, are not intended to

44 See chapter 7, Findings and Conclusions.

be statistically representative, both Strauss & Corbin and Miles & Huberman make reference to the importance of representative sampling. This researcher believes he has achieved a reasonable level of representation given the variety of individuals interviewed in the study. However one draw back must be admitted, namely the selection of interviewee's by DrugCo personnel. In particular this researcher recognises that the dissenting voices may have been missed. Furthermore two areas of the DrugCo were left untouched. Firstly, attempts to move from accountants in the production subunit to management proved impossible when suggested further contacts were unresponsive. Secondly this researcher unfortunately made the oversight of failing to include the clinical function in his research. This function, it is believed has a different strategy to the Process R&D function. However, both accountant and non-accounting staff, and personnel from different parts of the organisation (both along the value chain and at different levels of the management hierarchy) participated in the study.

In addition, to authenticate the concepts, the researcher has presented the emergent concepts to previous respondents, with mixed response. Transaction cost economic perspectives received a mixed response from interviewees. The notion of human capital being specific was questioned, whereas the importance of being located in close proximity (site asset specificity) was appreciated. Furthermore, alternative explanations were noted, which formed the basis for a negative case analysis. This feedback provides further assurance to the construct validity of the concepts developed in the case study.

4.6.3 Negative Case Analysis

A negative case analysis was performed based on the results of these two return interviews. The political aspect was seen as being unrepresented. This raises questions over the danger of the use of prior theory. Because political perspectives have not been represented in previous research, they did not emerge from the interview data until late in the research. However, two points should be

noted. Firstly this research took a functionalist approach, and hence it can be argued that political dimensions were not intended to be explored. Secondly, it was admitted that the political dimension was not divorced from the functionalist concerns, but rather the political debate was over the practicalities, in particular the benefits & costs involved. Therefore the importance of the concepts was not disproved by the negative case analysis, but was shown to be incomplete without the political and power dimensions. The evolutionary nature of the "DrugCo model" was also noted, suggesting, as was found by Colbert & Spicer, that history also plays an important role in the accounting systems of companies.

4.6.4 The New Research Question

The original research question was to provide some evidence of the validity of the current transfer pricing frameworks, but this has turned towards an exploratory piece of research. Thus the current research question asks what factors explain the differences in the use of cost allocation within a large pharmaceuticals company.

Chapter 5 The Research Organisation

5.1 Structure & Strategy

DrugCo's research organisation can be seen at being located at the beginning of the company's value chain, and also at the extreme end of the continuum of accounting information utility, or lack thereof. The primary purpose of this organisation is to identify candidate drugs from chemical compounds. Candidate drugs are passed to the development organisation subject to the approval of the board of directors, and that decision will draw in information from a number of parts of the organisation.

> "Nearly the whole organisation, so the marketing people, the manufacturing people because there is no point having a great technical drug which the R&D people have made in a test tube, but that no body can manufacture it to full scale. The product strategy people, so is this the right product area we want to be in, and obviously the scientists."
>
> (R&D Accountant)

The move from candidate drug into development is one of the major decisions of the company given the enormous cost of developing (when the attrition rate of approximately 90% is taken into account) & marketing drugs. Therefore the research organisation is tasked with the job of finding those candidate drugs that combine the potential to be valuable prescription drugs with a higher probability of successfully passing Federal Drug Administration (FDA) phases to become approved prescription drugs.

The research organisation is organised as four relatively large hierarchical structures, with approximately five thousand scientists in total, called "Research Areas" or RA's. Each of these RA's are organised to specialise in a particular

disease area: Respiratory/Inflammation, Cardiovascular/Gastrointestinal, Cancer/Infection, CNS/Pain Control[45]. Each of these RA's appears to be a relatively autonomous organisation, with little sharing of information between RAs, and information regarding decisions appears to be relatively decentralized. This type of structure allows the RA's to operate relatively autonomously, and great flexibility is claimed within the RA's. The sharing information is perceived by management of the organisation as "disappointing", suggesting coordination between the RA's is minimal, and would appear to be the price of such an organisation structure.

Eccles (1985) adopted Porter's (1980) definition of vertical integration as "the combination of technologically distinct production, distribution, selling, and/or other economic processes within the confines of a single firm". Diversification is a more complicated variable in Eccles framework, where at the sub-unit level he refers to whether a sub-unit is "viewed as a distinct business on both internal and external sales", whereas at the organisational level diversification is defined as "the number of different businesses in which the company competes and to how different those businesses are from each other". In the case of the RA's, diversification can be defined as the number of disease areas that they service, thus the individual RA's have a low level of diversification. Therefore each of the RA's are located in the top left hand corner of Eccles' MAP as cooperative organizations.

5.2 Project Solidity

The solidity of projects appears to be of great importance of the company. Only approximately one in ten candidate drugs manage to pass the clinical trials to become a prescription drug. However this high attrition rate pales compared to that in research. Henderson & Cockburn (1994) estimated that only one in a thousand compounds that are investigated reach the stage of becoming candidate

45 From the slides of a presentation given by the vice-president of research, DrugCo, 18 August 2003.

drugs, consequently the lifespan of projects within research can be very short. In addition the bounds of a project are unknown, that is to say, the realized potential capabilities of a compound many change, and hence the aims of the project may change. The fluidity of a project can therefore be defined as a combination of the age of the project, the expected lifespan of a project, and the likelihood of changes to the needs & aims of the project.

5.3 Human Capital

The research organization employs approximately five thousand scientists, and therefore would be expected to have considerable amounts of human capital, and what is called under the Transaction Cost Economics school human asset specificity, that is investments in human capital that are specific to DrugCo, such that their re-employment in other uses would result in a considerable loss in the investment. Differences in levels of human capital between the different organizations of DrugCo would be expected to be a primary explanatory variable for differences in both accounting systems and use of accounting figures.

However measurement of human capital and human asset specificity has proven to be difficult to gauge, even in interviews. Most managers seem to think their personnel, including scientists, did not have skills that were specific to the operations of the company. This difficult suggests that the concepts of human capital and human asset specificity needs careful exploration and consideration.

5.3.1 Comparisons & Relative Concepts

One suspects that there is a problem of relative views here, that is to say a manager in say a research area believes his people have fairly general skills simply because those skills are the only ones the manager is accustomed too. The solution to this problem appears to be to ask interviewee to make comparisons between types of unit, such as the research organization versus the development organization, between different skill types, between internal units

and comparable outside suppliers, etc. One suspects the need to measure concepts by comparison has a deeper implication, from an interview tool, to viewing social concepts as relative constructs, that is instances of social concepts rarely have absolute values in the real world, rather any instance can only be understood relative to the other instances of the same concept.

Despite the success of the comparative technique caution is advised. Two scenarios have so far been evident when asking interviewees to make comparisons between organisation subunits. Firstly the interviewee maybe the head of one of the subunits, in which case his or her opinion is probably biased toward his/her own subunit, and thus when outlining the differences between their subunit and the others, they will probably put greater weight on the benefits of their own subunits configuration. The second scenario is where the interviewee is the head of a subunit that is senior in the organisational hierarchy than the subunits being compared. While this may seem to be a scenario where less bias is likely, it should be remembered that in an organisation such as DrugCo, the interviewee is likely to have moved up through the ranks of the company, and therefore may have worked for one of the subunits in question in the past, and as such, they may also be prone to biases in their comparisons. A variation on this second scenario is that the interviewee has not come up through the ranks of DrugCo, but has been brought into the company, having worked in the pharmaceuticals industry elsewhere. Such an individual is likely to have worked in a particular scientific discipline that fits to one of the subunits being compared, and as such there is still the potential for bias when comparisons are made between subunits.

Both these scenarios require consideration by a researcher. He or she should be aware of the possibility during interviews, and be on the look out for such biases in the interviewee. However the bias may not always be a great problem. Certain pieces of information do not appear to be in much doubt, such as the uncertainty regarding different skill types & functions, the flexibility of certain disciplines, etc., rather the advantages of different configurations tend to be seen

differently by different interviewees. Thus the relative positioning of instances does not appear to be difficult, but gaining an understanding of the advantages & disadvantages of any particular instance requires multiple interviewees from different perspectives.

5.3.2 Human Asset Specificity

Making reference directly to economic concepts such as asset specificity was generally considered a bad idea. The words "specificity" or "specialization" have not been found to illicit particularly useful replies from interviewees. However the use of metaphors has been useful for capturing notions of human capital and the specialisation of human capital. In particular two metaphors where found to be useful, "flexibility" and "learning curve", and they usually resulted in the interviewee talking at length about the flexibility of the personnel within their part of the organisation and the learning curve gained in the course of the projects. However, as noted above, most managers felt their personnel were flexible, but asking the manager to make comparisons between the flexibility of personnel in different skill types within their function and between their organisational unit and others was more successful.

5.3.3 Flexibility

Employing the comparative technique, comparison between skill types suggested that the professional qualifications of employees made them more flexible than others, for instance chemists were seen by one manager as being more easy moved between different Research Areas than biologists.

> "the time of the merger, or shortly after the merger, it was decided to move our infection research from (site X), over to (site Y). Obviously a few people had to go with it, and what they found was that those who didn't want to go with it, the chemists, they could quite easily move across into oncology, or

inflammation, or one of the other research areas, and they could carry on making molecules, it's all generalist, it's chemistry. Whereas when it came to the biologists, they were much more specialized, so they were experts in infection biology, and that didn't actually transfer into inflammation biology or oncology biology, so these people either had a really difficult time retraining, or they left the company to go join a company where their specialist skills could be used, or they went over to Boston."

(Project Manager, Development)

However flexibility did seem to depend on the structure of the organisation and also the stage of the project. Another manager in research felt his people were moved around relatively easily due to the joint control of projects and personnel in research, and the early stage of the projects.

"I think part of the problem in (research) is that there's so much uncertainty in general you don't always know what services will be needed, and we learn as we go along. But I think that's probably less of an issue for early stage project than it is for development, because we're in a position where we manage the project and the people, so if we need something different we should be able to move fairly fast to acquire the right people. I think it's in the down stream projects in development, where the projects and functions are separated that can be a new challenge in the process."

(Research Manager)

5.3.4 Learning Curve

The second phrase that was found was "Learning Curve. One manager felt that knowledge that was generated even for specific projects was often found to be reusable in other projects. Indeed he felt that often a great failing was the inability to recognize when someone has already learned the skills necessary, and thus the company's employees can go through "steep learning curves", only to find someone else already has the knowledge.

> "It's amazing that, you know, the knowledge that is generated where you don't have any experience, it's remarkable how often something similar comes up in the future, and the challenge for us is that usually, person's learned the particular skills and another project finds the problem. So if we are not careful we go through the same steep learning curve with a new set of people, and the challenge for us is to make sure that we have some corporate memo about the issue."

(Research Manager)

The reference to "steep learning curves" suggests that considerable investments are made in specific knowledge for specific projects. Does it matter if the person leaves after the project has finished? That probably depends on whether the skills are transferable, as noted above. Is specificity to projects an important variable? Surely specificity of skills to a department or the company is the important variable? Ultimately what is suggested is that more research is needed in to explore the concept if "learning curves".

5.3.5 Networks

As noted by Bhimani & Roberts (2004), information transfers are important to knowledge management. The networks within organisations created to transfer

information would appear to constitute an important source of competitive advantage, that is to say they represent human capital that is strategically important, hard to replicate, and specific to the organisation and it's component parts. McNamara et al. (2004), outline a number of forms of knowledge network, which can be seen within DrugCo. Reuse of information can be seen to be important to the company, although it was also noted that failures to reuse information learned in one part of the organisation was one of the "disappointments" of the organisation. Learning from previous failures was also noted by another manager, who noted the importance of both trying to bring together project management to learn about failures from each other, and the importance of learning about failures when passing project from research to development[46]. Thus networks and organizational structure are linked.

5.3.6 External Networks

External structural capital can also be seen in the existence of investments made in relationships with outside parties. Programs with universities are also undertaken, which represent another form of structural capital. This type of structural capital would appear to be less relevant to the TCE school given the lower scope for opportunistic behaviour by the universities. However comparisons of internal & external structural capital, that is the networks established to share and transfer information within different parts of DrugCo and with external parties, may be helpful in outlining the dimensions of interest, in much the same way that comparison of external control problems and internal control problems help illuminate each other. What type information is transferred, do the internal & external networks lend themselves to different types of information, what are the gains from the networks?

This in turn leads to the importance of maintaining relationships with certain

46 This last point notes a potential omission in Henderson & Cockburn's (1994) work. They note two dimensions along which information can be transferred: Between different scientific disciplines, and between disease areas. But a third one potentially exists, namely between stages along the project pipeline.

external parties, even to the point within the research organisation of providing services to outside parties to help maintain those relationships:

> "Not fairly often, but it does happen. Not in a commercial way. For some academic research and clinical groups outside, we would provide support. Not always for DrugCo products ... and that's basically a case of good relationship, it's a minor complication, it's not something we would significantly undertake."

(Research Manager)

5.3.7 Location

The importance of location is both evident by the concentration of the research and development operations on a few large sites, and while projects can run over several sites, it has been noted by interviewees that they try not to have a project run on too many sites.

> "Where the specificity I think I would actually draw your attention to is more, is the fact we are geographically on a number of sites, and therefore physically you can't move huge bunches of people around, and those sites don't all do every research activity. This site here has a speciality in oncology, and things like that. We don't do certain types of research on every site, so that is more than a limiting factor, I would suggest. So I think it's more geography."

(R&D Accountant)

This suggests that close physical proximity is important in running many of the teams. This in turn suggests that there may be a link between Transaction Cost

Economics human asset specificity and site asset specificity, that is the networks of project members created to develop a compound represent an investment in the human relational capital of the company. This capital is dependent on the close proximity of project members. This suggests there are limits to the use of modern communications technology and formal communication & information systems to allow project members to share information.

> "So, I'll quote a worst case, but there will be occasions where we do a fantastic job of solving a problem, and then discover that in the next building there was somebody who solved the same problems two years ago. And that's about just a complex organisation getting better at sharing information."

(Research Manager)

One of the most striking aspects of DrugCo's operations for anyone visiting one their main research sites, is the sheer size of the operations at the site. Interviews suggest that there are five thousand scientists in the research organisation, and another five thousand in the development organisation, making a total of ten thousand scientists. With nine large sites, that makes for approximately a thousand scientists at each site. Why should the operations of the company be so concentrated?

5.3.8 Structure & Human Capital

Henderson & Cockburn (1994), as noted before, outline two dimensions to the human capital within pharmaceuticals companies (in their words "component competence"), disease areas, that is groupings with expertise in particular categories of disease, and scientific disciplines, that is groupings with expertise in particular scientific or technical disciplines. However the dimensions of "competence" can be extended to categorize the structure of DrugCo and the networks operating in and between those structures. The research organization

clearly falls within the category of structuring its networks and operations to focus on disease areas. This contrasts with the development organization that will be covered in the next chapter. So far no notion of communication between the RA's as regards scientific disciplines has been uncovered, suggesting that networks focus on scientific disciplines are relatively few, and hence the extent of human capital focused on scientific disciplines is comparatively low.

5.3.9 Conclusion on Human Capital

In conclusion we seem to have advanced to the point of having a greater understanding of the dimensions of human capital, and also the tools to measure that capital, at least in a rough way. Research has mainly high site specificity, which is the first indicator that the human capital exists not so much in individual scientists and other employees, but rather in the networks that exist within the research areas.

5.4 Temporal Capital & Monitoring

Temporal Asset Specificity has been noted by TCE researchers before (Williamson, 1985, 1991), but this has referred to the importance of timely delivery of intermediate goods for Just-In-Time manufacturing where one party, usually the buyer, places itself in a vulnerable position whereby failure to deliver the goods on time by the supplier will cause production facilities of the buyer to cease due to a lack of materials. However, evidence from DrugCo suggests another way in which companies can put themselves in a vulnerable position as regards time. DrugCo's R&D is essentially a project based model, and one suspects many companies have a similar project model within at least part of their organisation. One obvious element of the project model is the time taken to complete a project. As a pharmaceuticals company, DrugCo's projects generally take several years to go from chemical compound at approved prescription drug, and thus the company's projects are probably at the extreme end of the project lifespans, but nevertheless, any significant time spent on projects represents a

investment of time by any company. This is relevant to outsourcing considerations, since numerous parts of a project that could potentially be outsourced would themselves require a certain amount of time to be completed by the external party. This time again represents a form of investment by the original company in the transaction between the two parties. This investment is vulnerable to failures by the external company to complete the project successfully. The added complication is that success is not always guaranteed. Managers interviewed in DrugCo noted the difficulty in controlling external work.

> "There are other companies including small biotech companies, who aim to deliver the candidate drugs that we provide ... we ask an external group to go and do it, but then usually it's very difficult to rein that in if it's going wrong, or close it if it's not such a good idea."
>
> (Research Manager)

The quote above demonstrates that monitoring and controlling external work is are factors related to temporal asset specificity. Temporal asset specificity can be measured as the amount of time between agreeing a piece of piece of project work to be done and delivery of that work. Monitoring is the difficulty in determining the successful completion or project milestones and detection of problems occurring in the project work.

5.5 Physical & Dedicated Capital

Despite it's large size, managers at DrugCo seem to feel that most of their equipment is not particularly specific to the company. Some feel that the chemical equipment that the company has could be used not only throughout the pharmaceuticals industry, but also throughout most of the contract chemical industry. Thus physical capital does not appear to be of great strategic

importance to the company. However it appears the company does have significant amounts of capital at its sites, and judging by the fact that this researcher has usually found himself having to negotiate building sites at almost every visit to their largest site, the amount of physical capital is increasing quite quickly. However this is perhaps further indication of the importance of location, that is site asset specificity, whereby large amounts of physical capital are concentrated on a few sites.

Dedicated asset specificity is rather difficult to judge. Smaller pharmaceuticals companies, including the biotechs, do uncover candidate drugs, and take them to certain stages in the development process, and then sell the rights to the large pharmaceuticals companies. Therefore we may conclude that the extent of dedicated asset specificity is lower than in development. However, the size of the research organisation is still considerable, with approximately five thousand scientists, and their was a feeling that the payment made for externally generated candidate drugs was higher than the comparative cost for producing candidate drugs internally.

> "... either we buy the candidate drug after it's discovered, in which case the price tag is huge"
>
> (Research Manager)

This in turn suggests that the market for candidate drug is not fully developed, again suggesting that the pharmaceuticals industry may have difficult absorbing the size of DrugCo's research operations.

5.6 Sourcing

The concept of the "make-or-buy decision" has a long history in the transfer pricing literature. However the usage of this term has no immediate reaction from accountants or managers (except in one case laughter!), and should be

abandoned in favour of the word "sourcing" or "outsourcing". The two concepts are the same, with the words "sourcing" or "outsourcing" eliciting responses from interviewees. The decision to source supplies internally or externally is also the focus of Williamson's work, although geared to explaining the size of modern corporations rather than the pricing or costing of internal goods & services. More recent transfer pricing research, especially the research of Spicer (1989) and van der Meer-Kooistra (1994) has drawn on Williamson's Transaction Cost Economics as a theoretical basis, suggesting it is impossible to separate the pricing and costing methods used from the sourcing decisions of the company for the particular goods & services in question.

In addition, as noted before, the use of comparisons is an effective technique in interviews, thus comparison of the difficulties of controlling internal work relative to the control of external work does seem to be a potentially fruitful direction for research. Indeed, some managers seemed to appreciate the utility to be gained by getting them to make comparisons between internal and external sources, although the previously mentioned caveats apply here as well (see section 5.3.1.).

Previous researchers have made a clear distinction in the past between whether goods & services are bought externally & internally. However, early on in this research it came to the attention of this researcher that this view did not hold in DrugCo. Shortages in internal capacity was one of the main & repeated reasons given for sourcing externally, that is to say, the company is perceived as having a capability wide enough to perform most of the tasks required in pharmaceuticals development, but it does not have the capacity to fully satisfy it's own internal demands. This was explained by one manager (and I believe in line with older research) as being due to the difficulties in increasing & decreasing capacity. This was mainly due to the costs associated with hiring & firing personnel, and the time required to build up an internal supply. The second most common reason given by managers for using external sources was a lack of internal expertise, although this was seen as a rather distant second given

the company maintains a wide capability. Thus two quite different explanations seem to exist.

The clear distinction that previous researchers have made between whether goods & services are bought externally or made internally seems somewhat questionable. The first explanation given above raises the problem of the company (and potentially other companies) sourcing the same services both internally and externally. This contrasts somewhat with the rather "all-or-nothing" approach of previous TCE researchers[47]. More importantly it raises points over the correct wording of survey questions. Questions regarding whether services are outsourced or produced internally are in danger of producing incorrect answers. Instead future research needs to consider the extent to which any particular service is outsourced. How such answers are treated is also an issue. Should research attempt to explain the extent of outsourcing for a particular good or service, or should responses be divided between the two different explanations. With this second possibility, situations where the use of external sources is due to a shortfall in capacity can be treated as a case where the good or service is essentially sourced internally, where as with a lack of internal expertise can be seen as representing a case where the good or service is sourced externally.

Within both the research and development organizations, managers have tended to emphasize the greater risks in using outside suppliers, regarding both control problems and fear of intellectual theft, and have also noted the limited capacity of outside sources to make up for shortfalls in supply. The use of outside sources is mainly restrained to two scenarios. Firstly for conducting relatively low skilled work.

47 While this researcher's own knowledge of the TCE literature is not encyclopaedic, he has not come across this consideration in any papers.

> "There will be some specialised aspects of a project where we want a lot of general information about a particular drug, and we will often go outside for that."
>
> (Research Manager)

This suggests the industry may have a number of small companies who specialize in providing services to all the larger research companies. These companies may employ relatively low skilled workers. The make up of the smaller companies within the pharmaceuticals industry may be important. Admittedly any investigation would be a minefield in itself, but consideration of the flexibility and skill levels between large pharmaceutical companies and smaller companies may be of interest. Does this mean there are two types of small company in the pharmaceuticals industry; those who specialize in relatively low skilled work and probably achieving some economies of scale since they provide to all the pharmaceutical companies; and then some companies that specialize in very specific high knowledge areas, but still not specific to any pharmaceutical company[48].

The second scenario is the use of universities for conducting research. Universities appear to be used for very early, exploratory type research. Outsourcing exploratory research to universities is partly seen by management as

48 An interesting, and no doubt heated discussion in the pharmaceuticals industry, is the developing market in pharmaceuticals drugs prior to completion of all three stages of the Federal Drug Administration (FDA), that is to say, some interviewees noted that some notion of a market that places a value on drugs that have reached a certain stage in development. Certainly the company does look at buying candidate drugs from small pharmaceutical companies, therefore any comparison between internal control & external control is (unfortunately from the researchers point of view) potentially open to change in the coming years. Both accountants and managers within DrugCo have noted the growth in the far east, especially China & India, and the production excellence of manufacturers of off-patent drugs is not doubted. However, considerable drawbacks still exist, most notably the lack of trust of such companies concerning intellectual property rights, and more generally sharing information.

being a good way to handle the high risks of such early work. This makes for an interesting contrast with the general spectrum in DrugCo. As noted above, managers in both research & development perceive outside suppliers of services to be risky, in contrast to production where outside suppliers are seen as a way to reduce certain risks. Thus one can see a general trend towards decreasing perceptions of risk in using outside sources as one moves along the value chain of DrugCo, and yet right at the extreme end, that is, at the very early stages of research, this is turned on it's head, and universities are seen as a way of reducing risk. Internal projects are seen as being costly to set up, while providing funds to universities for exploratory work appears to be seen as a low cost alternative.

> "... the other way in which we go outside is if we, we do I guess about two, five & ten percent of the (research) budget is spent outside with collaborators who are working in new areas and rather than setting up a big project internally where the uncertainty is greatest, we will invest in maybe a university to try and explore a new area."
>
> (Research Manager)

One suspects there are several explanations for this. Firstly as noted above, projects may be expensive to set up internally. Secondly one suspects that the larger scientific based universities have already developed rather sophisticated legal structures and contracts for dealing with intellectual property rights issues. Finally, the extent of opportunistic behaviour may be perceived as being less with academic institutions whose main focus is on scientific discovery rather than profit maximisation.

Outsourcing decisions tend to be decentralized within the research organization. A senior manager within the research organisation justified this on the grounds that the knowledge to make the correct decisions over the use of outside sources

is held lower down in the management hierarchy. Lastly, as noted before, the research organization does provide services to outside parties.

5.7 Accounting System

The accounting system within the research organization is fairly simple compared to other parts of DrugCo. The costs of Full Time Equivalents (FTE's) are not allocated to projects within the research organization. The exception to this rule is where particular members of the research organization continue to work on projects that have been moved into the development organization. In these circumstances FTE's are allocated to projects via the timesheeting system.

> "The exception to this would be when we have people working on something beyond the candidate drugs (Allocation to Project), there's something for development, those costs would be, cost and time of people would be allocated in a fairly detailed way."
>
> (Research Manager)

This also underlines an important point. The research & development organizations, although they are separate entities, the progress of any individual project from research to finally receiving FDA approval will take several years, consequently the teams that work on that project will evolve over time, and for a number of reasons. One obvious example is the hand over from the research organisation to the development organisation. While the move from research to development can be seen as quite distinct from the view of the top board of the company, that is the decision to move a candidate drug into the development pipeline is a main board decision, from the view of the teams lower in the organisation, the distinction becomes more blurred, in particular members of the research organisation can find themselves working on a project after it has moved into the development pipeline, and therefore their work that constitutes an FTE is included in the accounting system of the development organization,

necessitating the use of timesheets.

> "The exception to this would be when we have people working on something beyond the candidate drugs, there's something for development ... cost and time of people would be allocated in a fairly detailed way."

(Research Manager)

There are hints however that records of some type are kept on employees involvement in different research projects. This suggests that the official accounting system is burdensome on the activities in research to necessitate it's use.

> "What I can say is that our biggest cost is people, we have measures of number of people involved in projects."

(Research Manager)

A warning does seem appropriate here. Although accounting information may be of little value in certain uses in a particular area, it may be of great importance for other uses in the same area. Studies that attempt to measure the "usefulness" of accounting data, probably based on theories attempting to explain the usefulness of accounting data, are potentially open to misleading results. Even in the research organisation, accounting data is perceived as important for the use of budgeting, even though it appears to have little use in judging performance beyond the need to stay within budget, and too burdensome for allocating human resources amongst projects. Thus although one may be tempted to hypothesize that as human asset specificity increases and project fluidity & uncertainty increases, accounting data becomes less relevant and useful, this is misleading at best. The researcher must be aware of the possible relative nature of the concepts under investigation. The "usefulness" of

accounting information within the research organization should be judged relative to other pieces of information that are used. Thus although accounting information is perceived as useful, when placed in context to other pieces on information its relative relevance is perceived as low.

> "The majority of my targets will be non-financial (Quantitative), unless I started to have a problem. If I had a record of over spending the budget, abusing the budget really."
>
> (Research Manager)

That timesheeting is not used for research projects, has been put down to a number of factors. Projects are, as noted before, fluid, that is they are young, expected to have short life-spans, and with uncertain futures and aims. Attaching costs to such fluid projects is seen as problematic by both managers and accountants, but also given that the costs of the research organization are dwarfed by the development organization (approximately four time the size in costs), timesheeting and project costing is seen as relatively unimportant. Finally a political dimension exists in that the head of the research organisation refuses to allow timesheeting of this personnel without a good reason for doing so.

5.8 Conclusion

The research organization demonstrates three important points. Firstly, it is structured as four heavy weight hierarchical cost centres that have low diversification in that they only research on particular categories of disease, and where the competencies and networks are geared to the those disease areas. Secondly, sourcing decisions are decentralized due to the localization of the knowledge required to make those decisions. Thirdly, the accounting information is only basic, and no project costs are calculated apart from an average cost per drug. As will be seen in later chapters, this contrasts starkly

with other parts of DrugCo.

Chapter 6 The Development Organisation

6.1 Introduction to the Development Organisation

In the previous chapter we covered the first of three organisations identified as child units in DrugCo, the research organisation. We saw an organisation where the accounting information, while seen as important in some aspects, it played little role in the control of individual projects. In this chapter we shall cover the next stage of the R&D process, namely the development organisation, which as we shall see, has a radically different strategy, structure, and accounting system. This difference has turned out to be perhaps the source of the greatest interest in this study.

It is the first of these differences, in strategy & structure that we will cover first, along with a discussion of the relevance to Eccles' framework that places great emphasis on strategy for explaining transfer pricing practices. The types of asset employed in the development organisation are the subjects of much exploration, especially since the characteristics of the assets have proven so problematic to gauge, but some light is shone on possibilities for future research.

Finally the location of sourcing decisions and cost allocation system are discussed, including the partial use of cost allocation for projects, and the lack of centralisation of sourcing decisions.

6.2 Portfolio

The company's model is centred on the portfolio or pipeline of candidate drugs in development and the prescription drugs in production. The development organisation in DrugCo is tasked with the development of candidate drugs through the three phases of the Federal Drug Administration (FDA) drug approval system[49]. This chiefly involves clinical trials, but additional functions

49 DrugCo Annual Report, 2004

are required, namely, further pharmaceuticals development, production development, and legal servicing.

The main board of the company makes decisions regarding whether to proceed with clinical trials with a candidate drug and to abandon a candidate drug. However the information required to make such decisions is very wide, and includes input from numerous functions & groups within the company.

> Allocation of resources is "through a portfolio process, that balances projects close to launch and projects that are at a very early exploratory stage which could fail very soon, and make sure the projects cover the therapeutic areas that from a strategic point of view we wish to be in. Nearly the whole organisation (has an influence), so the marketing people, the manufacturing people because there is no point having a great technical drug which the R&D people have made in a test tube, but that nobody can manufacture it to full scale. The product strategy people, so is this the right product area we want to be in, and obviously the scientists. It's worth talking to them. Do we have any expertise?"
>
> (R&D Accountant)

This does seem to be the first indicator of the increased level of decentralisation and increases in autonomy within the research and development organisation within DrugCo. Thus although the decision to transfer from research to development is a main board decision, we do see considerable information being passed upwards. Later we will see that other decisions are more decentralised.

However caution is advised. Although there is an all-encompassing strategy to DrugCo, different parts do have local differences in strategy as well, reflecting the different circumstances of the individual parts.

6.3 Organisational Structure & Strategy

The structure of the development organisation is remarkably different from either the research or production organisations. The research organisation is structured into four research areas, each concentrating on a particular disease area, and where each is essentially a classical hierarchy, whereas the development organisation is structured as a matrix (see illustration 6.1). On one axis of the matrix are a number of therapeutic areas (TA): Cardiovascular, Gastrointestinal, Infection, Neuroscience, Oncology, Respiratory & Inflammation[50]. These TA's represent the pipelines of candidate drugs that pass through the development organisation. These are the continuation of the research areas from the research organisation, although there are more TA's than RA's, in other words the value chains branch when they enter the development organisation. On the other axis of this matrix there are four functions that serve the numerous projects that are associated with the therapeutic areas: Clinical, Pharmaceuticals, Process R&D, & Regulatory. Consequently the activities of the functions within the development organisation cross the boundaries of the different therapeutic areas, such that functions will find themselves working on many projects, approximately sixty, at once, compared to the relatively smaller number of projects that any particular RA will be working on at any one time. Most of the scientific and development personnel sit within these four functions. Later in this chapter we will explore the hierarchy of project teams that is used to achieve integration of the matrix.

50 ibid.

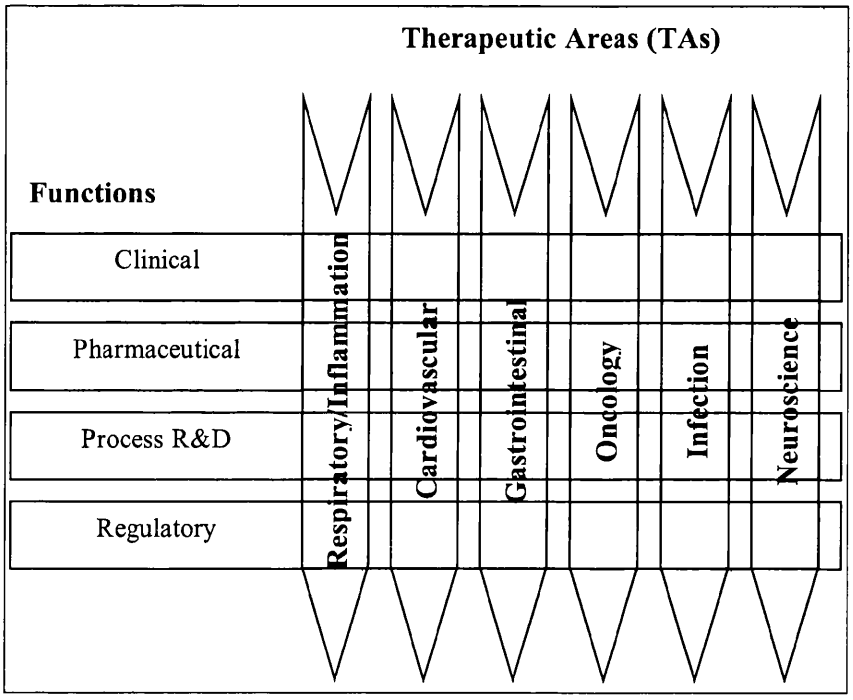

Illustration 6.1: development Organisational Structure

The different structures of the research and development organisations are in accordance with Henderson & Cockburn's (1994) recognition that the core competencies within the pharmaceuticals industries fall into two categories: those competencies geared towards a particular disease area, and those competencies geared towards a particular scientific discipline or technology. The structure of the research organisation is clearly constructed to orientate the RA's towards particular disease areas. Whereas the development organisation has chosen to place its personnel in functions that are focused toward particular disciplines.

Eccles (1985) research on transfer pricing found an association between the strategy and the structure & transfer pricing system employed by companies, which he formulated in to his Managers' Analytical Plane (MAP). Eccles MAP has two distinguishing features. Firstly it decomposed strategy into two orthogonal variables: vertical integration & diversification. Secondly it works at the aggregate company wide level.

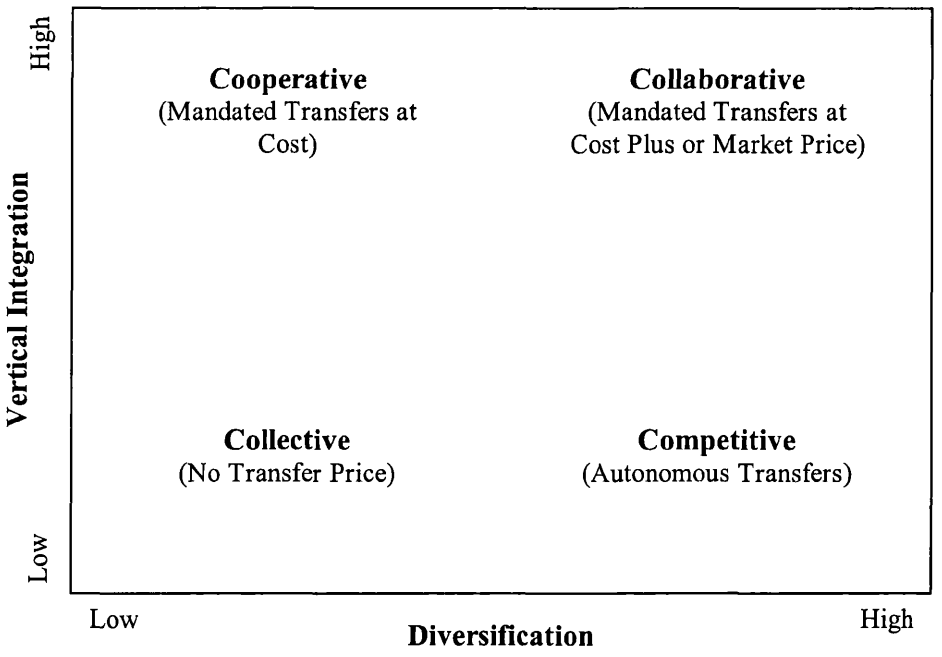

Illustration 6.2: Eccles' (1985) Managers Analytical Plane (MAP)

Comparison between DrugCo's two R&D organisations and Eccles' MAP suggests a number of points. Firstly that the two strategic variables are operating at two different levels. DrugCo is vertically integrated, with operations from early pharmaceutical research to the production of prescription drugs. There is no clear way this variable can be seen to vary in value between different parts of the company. Diversification on the other hand, can be decomposed into the two variations based on the two different competencies, namely disease area and scientific discipline. Therefore the variable of diversification can be seen to vary between the research and development organisations. The four RA's within the research organisation, since they each are almost entirely self-contained[51] organisations that each concentrate on a separate set of disease areas, can be seen as having low disease area diversification. In other words they concentrate on a smaller range of diseases than a function in development will.

51 The four RA's are serviced by three service functions: Information Services, Safety Assessment, and Emerging Sciences & Technologies. However, the RA's seem to contain the bulk of the personnel in research, unlike the almost virtual TA's in development.

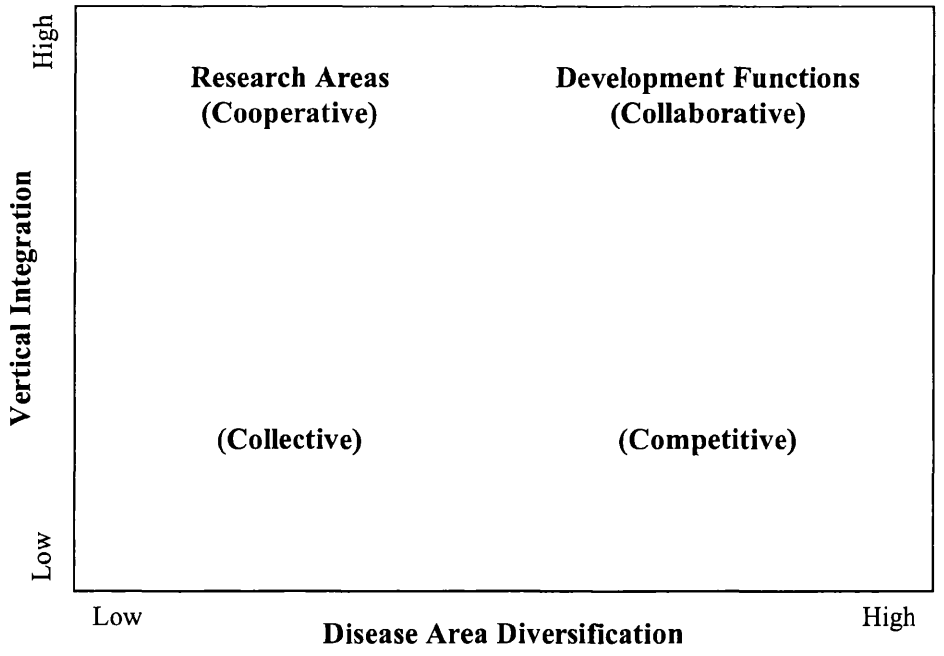

Illustration 6.3: Eccles' MAP with Disease Area Diversification

Although comparison is less easy since one would imagine that research as a whole will require a narrower skill set compared to development. However, each individual RA, given it is self-contained, would appear to have a wider skill set than an individual function in development. Therefore we can say that the RA's have wide discipline diversification compared to the functions in development.

The functions within the development organisation, given they service more than one disease area, would appear, at first glance to have high disease area diversification, but low discipline diversification. More importantly, it shows that Eccles' diversification variable is not restricted to the company level, but operates at a lower level, differing between different parts of the company. As will be shown later, the structure & strategy are even more complex variables, for though the development organisation has an organisational wide model that encompasses the strategy & structure, the four functions within the organisation also have their own structure & strategy, some of which contrasts with the overall model of the organisation. Process R&D function within development

generally consists of chemists geared towards production of drugs within any of the disease areas. Other functions have geared their sites, via their "centres of excellence", towards particular disease areas.

So where can we place the RA's and functions within Eccles' MAP? If we take disease area diversification as one axis, and vertical integration as the other axis, then the RA's fit within the cooperative segment of the MAP, whereas the functions within the development organisation fit within the collaborative segment of the MAP.

6.3.1 Full Toolkits

The strategy of the development organisation has been explored above, but as alluded to already, the strategies within the functions differ amongst themselves and with the organisations overall strategy. Some functions have formulated a structure and strategy that is in line with the overall strategy of the development organisation. These functions are structured so that each of their sites has a full "toolkit", that is each of the sites has full complement if skill types such that it can carryout any of the tasks called upon the function.

> "How we are organised is three sites; this one which is (site X), there's another one at (site Y), and there's (site Z), and each of these has what we call a full toolkit, process chemistry, process engineering, analytical chemistry, development manufacture ..."
>
> (Project Manager, Development)

This suggests that the competencies of personnel within those sites are such that although they are specialised towards a particular scientific discipline, they are not specific to any therapeutic area.

One of the main advantages of running such operations is ensuring internal

capacity is used up, by moving work around to use up the human capacity:

> "I don't want to give you the impression we sort of move stuff around all the time, and certainly not for the sake of it, but probably eighty percent plus of the projects are just done on one site, when the other twenty percent you move around to make sure you use all your capacity up, and it's a much more efficient way than operating silos, and of course to some extent it's ... it's global versus local tension"
>
> (Project Manager, Development)

This it was felt was especially important in the uncertain environment of pharmaceuticals research where projects can suddenly be abandoned. By having a full capability on each site, if a project was suddenly halted for any reason, work could be shifted from other projects and sites to ensure personnel & capacity were used up.

> "we had a project recently that ran into problems, and I don't mean problems within here, I mean problems in the global product team, and you know, within a few days we had reduced our effort by three quarters, we just stripped people out of there and moved them onto other projects."
>
> (Project Manager, Development)

However, maintaining equal capabilities between sites becomes an issue, and as such sharing information between sites to maintain a roughly equal footing becomes important. To achieve this, a coaching role has been developed for each of the skill types within the function, as will be covered later in this chapter on teams within the development organisation. Regardless, even the globally

organised organisations appear to prefer to keep individual pieces of work on individual sites, suggesting the importance of close proximity for such high skilled labour intensive processes, and the limitations of modern communications technology. Different sites also bring their own histories and cultures that should be considered. Some locales, mainly due to national differences, lend themselves towards other capabilities, even within globally organised functions.

> "one example I suppose is that process engineers in the UK when they come out of university, basically are number crunchers, you know they've been taught to do difficult calculations, vent calculations, they're geared toward building gigantic crackers and all this sort of stuff. Process engineers in (country X) have a lot, lot more chemistry is their syllabus, and what they're geared to ... basically (country X) hasn't got a chemical industry, nobody wants giant crackers and vent calculations and all this sort of stuff. What they want, and the few they turn out, is process engineers who really understand processes, and you need a deeper understanding of chemistry for that. So in terms who does what, in (country X) the process engineers do all the crystallisation work of our products. In the UK that's all done by the process chemistry group."
>
> (Project Manager, Development)

Overall however it can be concluded that from the perspective of Eccles' framework, these functions run sites with full toolkits on each, and thus the functions are following the same strategy as the overall development organisation, with a high degree of diversification as regards therapeutic areas and low diversification regarding disciplines. Therefore we would place the "full toolkit" functions as part of the collaborative segment. This fits in nicely with the matrix structure employed by the development organisation, as

predicted by Eccles for organisations employing a collaborative system. From the perspective of Spicer's framework the capital employed within these functions is likely to be specific to the skill types within the particular disciplines. For instance grouping and team structures would be expected to focus towards particular disciplines rather than disease areas.

6.3.2 Centres of Excellence

Whereas some functions are organised to focus on a particular discipline, and provide full capabilities on every site, other functions have opted for a different structure & strategy. Instead of maintaining full "tool kits" on every site, they have set up "centres of excellence" at different sites.

> "Where the specificity I think I would actually draw your attention to is more, is the fact we are geographically on a number of sites, and therefore physically you can't move huge bunches of people around, and those sites don't all do every research activity. This site here has a speciality in oncology, and things like that. We don't do certain types of research on every site, so that is more than a limiting factor, I would suggest. So I think it's more geography."
>
> (R&D Accountant)

These "centres of excellence" are geared towards particular therapeutic areas or technologies. Given the group & team orientated nature of capital in pharmaceuticals development, it is likely such functions have been structured to allow greater development of individuals & teams, suggesting much investment in new skills[52].

52 Future researchers may also want to investigate the networking between clinical operations in pharmaceutical companies and the medical community as a source of competitive advantage.

In contrast to the globally orientated functions, the "centres of excellence" appear to have found that the skills that are required are not general enough such that individuals & teams can cover all therapeutic areas the company pursues, but instead different individuals & teams specialise towards specific therapeutic areas or technologies. The human competencies within these functions are far more specialised, such that flexibility of personnel appears to lead to utilisation issues being more problematic & important.

> "Other functions which aren't as flexible, you know, just keep their full complement of people on it, even though the project was doomed and heading for the rocks, they just carried on working, because it was just difficult for them to move them on to other projects."
>
> (Project Manager, Development)

> "Where the specificity I think I would actually draw your attention to is more, is the fact we are geographically on a number of sites, and therefore physically you can't move huge bunches of people around, and those sites don't all do every research activity. This site here has a speciality in oncology, and things like that. We don't do certain types of research on every site, so that is more than a limiting factor, I would suggest."
>
> (R&D Accountant)

The cost of formulating such "centres of excellence" would appear to be difficulty in ensuring maximum utilisation of resources. The number of projects that can be shared around will be considerably smaller, suggesting the danger exists that work will continue on projects that have already been abandoned.

From the perspective of Eccles' framework, the "centres of excellence" represent

organisations that have both low diversification as regards both the disease areas serviced and the scientific disciplines focused upon. Given the high vertical integration, we would therefore expect these functions to exist within the cooperative segments of Eccles' MAP. However, given the different diversity strategy of the development organisation, the "centres of excellence" exist within the collaborative segment of the MAP. This apparent mismatch may have some consequences for the cost allocation system.

From the perspective of Spicer's framework, greater specific capital focused on the particular "excellence" is to be expected, especially groupings & teams. Team structures designed to ensure conformity between sites as found in the "full toolkit" functions, are less likely in the function employing "centres of excellence". Instead human structures are likely to be specific to the given "excellence". This represents a structure that is idiosyncratic in that it is likely to be particular to DrugCo and difficult for competitors to replicate.

Thus we can conclude that the levels of human asset specificity are high both for scientific discipline human asset specificity and disease area human asset specificity. In conclusion we can say that the strategy, structure and human asset specificity appear to be associated at the functional level, demonstrating a first link between the works of Eccles and Spicer. Since this link is evident at the functional level, we can conclude that the theories appear to be meeting half way along the vertical axis of the company's hierarchy.

6.3.3 Summary of Strategy & Structure

So far we have touched upon the complex structure that exists within DrugCo, and have explored its relationship between the strategy of the company and the strategies of organisational subunits of the company. Strategy has turned out to be more complex than Eccles formulated. Diversification in particular, turns out to be a multi-faceted factor, with different types operating at several levels. Different functions have interpreted and implemented different strategies that

focus on different aims & specialisations, and this has manifested itself in different structures. This was evident from the in the "full toolkits" and "centres of excellence". A number of points can be made about this organisational configuration.

Firstly the differences between functions are not necessarily as distinct as might be thought at first glance. Even in the function organised with "full toolkits", it was admitted that some work tended to be conducted in one country rather than the other because of the different education background of the scientists employed. Therefore the distinction between strategies appears to be a matter of degrees rather than absolutes. Secondly, this local versus global distinction gives further evidence of a link between site asset specificity and human asset specificity, that is to say that the levels of human asset specificity and types of human capital employed in a function may be associated with the organisation form taken by the function.

The "centres of excellence" suggest the need to specialise and pool individuals together at the same site. This shows that each site specialises both in particular disease areas and their functions technical discipline. Furthermore it demonstrates the importance of co-locating individuals to produce the service, suggesting a link between human and site asset specificity.

From the strategy & structure within the development organisation, we shall move on to discuss the dimensions of a number of the concepts that relate to the strategy & structure. Following this the connections between the structure, the cost allocation systems, and the locations of sourcing decisions are explored. It will be shown that the location of sourcing decisions is not necessarily the same as the location of the outsourcing search operation. The former is again tied in with the organisational structure, whereas the latter shows greater variance through the organisation. It will be shown that the cost allocation system is closely tied to the structure of the development organisation as a whole. This association of the structure to the cost allocation system means that the strategy

influences the cost allocation system via structure. However the close ties of the cost allocation system to the development organisations overall structure, means that the effects of both the strategy and the products' idiosyncrasies are moderated & aggregated by the structure.

6.4 Human Capital

The development organisation employs roughly the same number of scientists as the research organisation, approximately five thousand. Thus again, unsurprisingly, we have an organisation that would appear to have a large amount of human capital. As in the last chapter, the phrases "flexibility" and "learning curve", along with the comparative technique, have proved useful in eliciting responses.

6.4.1 Flexibility

Some skill types were seen as more flexible, for instance process chemists were seen as relatively flexible, whereas analytical chemists were seen as considerably less flexible, since the latter is seen as more of a mathematical discipline than chemistry. This was also seen when making comparisons between scientific disciplines at a more general level.

Flexibility of skills does appear to be a complex issue in itself. This was realised when one manager noted the one-way movement of personnel in his function between different skill types, that is there is a tendency for personnel to move from one skill type to a second skill type, but people rarely move in the other direction. For instance within Process R&D, personnel do move from process chemistry to analytical chemistry or process engineering, but rarely the other way around. Training is also undertaken by the company to help people move into new skill types & research/therapeutic areas, demonstrating another example of direct development of personnel that also suggests an attempt by the company to increase the flexibility of its personnel.

"So you know, people who in process chemistry can have a real interest in physical chemistry, and more sort of engineering end of things, go into here (process engineering) and don't reappear, and there's actually part time courses that are now run, that if you have a degree in chemistry, you can do this part time course and end up with a degree in process engineering, so you become a qualified process engineer. It's actually more difficult to do it the other way round. We have quite a lot of process chemists that have gone into analytical chemistry, because when they do their reactions what they really like doing is analysing the reactions and finding out what's going on, not the actual doing of the reactions, and so they tend to drift over here (analytical chemistry)."

(Project Manager, Development)

6.4.2 Learning Curve

As noted before, the other phrase that has also shown promise is "learning curve."

"But yes we learn huge amounts every time we do something"

(Development Manager)

Two managers made reference to individuals going through steep learning curves on projects, suggesting significant human asset specificity, and to the difficulty of reusing the information & skills used. Individuals are recognised to go through steep learning curves on projects making them important to projects even if not critical, and thus their removal from projects is "pretty stupid".

"What we try to do with project management is to keep the same person on the project ... I may be biased because I run the project management function ... but you know, it's pretty important you don't switch project managers around too often, because otherwise they lose track of what's been happen and how all things glue together, and the whole thing starts coming apart, and switching project managers around you end up with the project being a shambles."

(Project Manager, Development)

6.4.3 Networks

Both of the terms "flexibility" and "learning" are likely to be capturing what Sveiby (1997) refers to as competence. However, is not the only form of human capital in the organisation. Indeed, the amount of human capital may not be the most important factor. The numbers of individuals whose knowledge is critical to the company, scientists who are top experts in their respective fields, are relatively few in number. One accountant felt that most people are essentially replaceable.

"The real people we look to are the tops of their professions, and they are a relatively small proportion of the organisation"

(R&D Accountant)

However Sveiby also notes two other forms of human capital, internal structure and external structure, which are the networks formed, respectively, between the organisation's personnel and with external parties[53]. On reflection these two further forms of human capital can be seen in action, and are potentially available for measure. There appear to be several internal structures for both

53 These have both been briefly covered in the previous chapter

sharing information and controlling projects. Indeed the chief source of human capital that is critical to the company is not within the individual employees of the company, but rather the groupings & networks within the company.

As already noted above, development is organised into four functions, each generally focused on a particular discipline, and each of these functions supplies a number of "Therapeutic Areas" or TA's, which represent the pipeline of development through the clinical trial phases. The TA's and functions, in contrast to research, are held together with a matrix organisation that utilises hierarchies of teams. Each hierarchy is based on the development of a particular candidate drug. At the top of each hierarchy is a global team with representatives from each function, and which allocates work to the respective functions and coordinates activities geared towards the project. Lower down the hierarchy are teams based within the functions, and it appear that the responsibility for delivering the projects lies with these teams. This system appears to allow for a lightweight coordination mechanism with appropriate levels of decentralisation/centralisation & horizontal communication.

The company appears to have developed it's own diagrammatic metaphors for understanding the hierarchical organisation of the teams. Two interviewees, when asked to describe their organisation turned to what they referred to as the "Turtle" diagrams. Below is a simple example of one these diagrams. Each circle represents the collection of members of a team. Each project has a global project team, this being the team at the top of the hierarchy, with each member being a representative from the main functions within development, in addition to representatives from other functions such as outsourcing & procurement. Each member of the global project team is represented by a dot on the circle perimeter. Each member in turn sits on a core project team within one of the functions, usually as the team leader. The core project team has representatives from the different skill types, again represented as dots on the circle perimeter. Again these individuals are usually the team leaders from teams in the skill types.

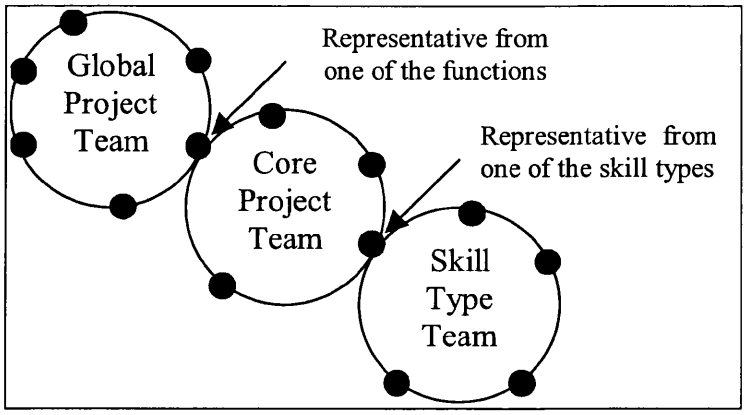

Illustration 6.4: Project Team Hierarchy (The Turtle Diagrams)

As noted by Bhimani & Roberts (2004), information transfers are important to knowledge management. The networks within organisations created to transfer information would appear to constitute an important type source of competitive advantage, that is to say they represent human capital that is strategically important, hard to replicate, and specific to the organisation and it's component parts.

The team structures put in place within the development organisation may represent one form of knowledge sharing mechanism, especially considering the length of time projects within development can last. The research organisation on the other hand, since it does not seem to have skill types crossing Research Area boundaries, would appear to have far greater information sharing between different skill types within RA's.

> "I would say one of the disappointing things is that we don't do that well enough (sharing information). So, I'll quote a worst case, but there will be occasions where we do a fantastic job of solving a problem, and then discover that in the next building there was somebody who solved the same problems two years ago. And that's about just a complex organisation getting better at sharing information."
>
> (Research Manager)

This appears to relate well with the distinction made by Henderson & Cockburn (1994) between component competence in disciplinary areas (in DrugCo these are seen as the different functions and skill types), and component competence in disease areas (Research Areas & Therapeutic Areas). Thus there may be a trade-off between information flows between scientific disciplines and information flows within scientific disciplines. While this may be particular to the pharmaceuticals industry, such trade-offs in different types of internal structural capital should be considered.

McNamara et al. (2004), outline a number of forms of knowledge network, which can be seen within DrugCo. Reuse of information can be seen to be important to the company, although it was also noted that failures to reuse information learned in one part of the organisation was one of the "disappointments" of the organisation. Learning from previous failures was also noted by another manager, who noted the importance of both trying to bring together project management to learn about failures from each other, and the importance of learning about failures when passing project from research to development. This last point notes a potential omission in Henderson & Cockburn's work, that is there appears to be three dimensions by which information can be transferred: Scientific disciplines, both within individual scientific disciplines and between; disease areas; and finally stages along the project pipeline.

McNamara et al. (2004) outline a second form of information transfer network for helping to ensure standardisation of skills, etc., across different parts of the organisation. This form of network can also be seen in action within DrugCo. The Process R&D function is spread across three different sites, and to ensure knowledge sharing across sites such that all sites operate best practices, the function operates coaching roles whereby and head of the different skill types within the function meet to discuss operations, and each meeting is headed by managers assigned a coaching role.

> "My other job is I'm the global head of process chemistry, so I've got a dotted line going across all the process chemistry groups. So we regularly meet with the heads of process chemistry, and we look at issues to do with process chemistry."
>
> (Project Manager, Development)

These coaching networks promote the sharing of information aimed at achieving approximately equal competencies between the sites regarding the same skill types. The question therefore remains whether other parts of DrugCo operate such cross-site networks to promote standardisation within scientific disciplines. The last form of network outlined by McNamara et al. is created to promote sharing from a distance.

The importance of human filtering is noted by some of McNamara's interviewees. The team hierarchies within DrugCo probably achieve such sharing. But it is important to note the fairly lightweight nature of the team hierarchies within DrugCo. One suspects that, relatively speaking, the functions with development can be kept relatively separate, whereas within research such separation has proved hard to achieve, mainly due to the inherently greater uncertainty, and possibly the greater interaction between the different scientific disciplines. This may partly explain the different structures and consequently

different accounting structures in place.

This however is still a rather static view of team structure. It should be recognised that individual projects within development can take ten years or more to complete. Consequently team membership will evolve over time, and for a number of reasons. One obvious example is the hand over from the research organisation to the development organisation. Since the transfer of candidate drugs from the research to development organisation is a main board decisions, the move can be seen as quite distinct from the perspective of the top board of the company. However, from the view of the teams lower in the organisation, the process is more complex and the distinction between organisations becomes more blurred, in particular members of the research organisation can find themselves working in the development organisation.

Another form of team evolution is the movement of individuals for their own development. One example of this is moving individuals to experience a successful project. Ninety percent of candidate drugs fail to become prescription drugs, consequently it is not unusual for someone to spend their entire career working on projects that never succeed in producing a prescription drug.

> "we might chose to move them for career development, so you know, it might be they've worked on early projects for years & years, because they've worked on an early project, it died, they worked on another early project, it died, ... what they need is a bit more experience elsewhere in the development cycle, so might chose to move them off an early project on to a later project"
>
> (Project Manager, Development)

Overall, this dynamic picture suggests much integration along the value chain of the organisation. One suspects that team structures are part of a wider perspective on human asset specificity. While the skills learnt by employees will

have some level of specificity to the company, the greater investments that are specific to the company are the networks that are created within skill types, teams, and higher up the hierarchy.

6.4.4 The Importance of Location

The notion of the importance of having certain operations concentrated on a few sites was brought to this researchers attention. The operations of the company, although spread across the world, appear to be concentrated on nine large sites. Furthermore, as we already know, a distinction can be made between the "centres of excellence" and the "full toolkits", which suggests that the extent of specialisation of sites appears to vary between functions within development. The existence of "centres of excellence" means, among other things, that certain functions have concentrated certain operations on particular sites, in turn suggesting that site asset specificity may be in action. Thus the conclusion is that the extent of site asset specificity varies between functions with development, from moderate in the case of functions with "full toolkits" on every site, to high for the functions with "centres of excellence".

6.5 Physical Assets

Moving on from human capital, we come to other forms of capital within the company. Unsurprisingly physical capital appears to be relatively unimportant within the development organisation. Managers tended to feel their equipment was not specific at all, and most physical capital that was bought tended to be used for many projects.

> "in general most of the equipment we would buy would ultimately have uses for more than one project"
>
> (Development Manager)

> "in theory for us our assets could be used by anyone else in the pharmaceutical industry that wanted the ability to make a plant, or could be used more widely by the chemical industry"
>
> (Project Manager, Development)

One suspects that Regulatory is unlikely to have much specialised equipment. Unfortunately no evidence was collected for the clinical function. But overall, the tentative conclusion can be made that physical asset specificity remains low.

6.6 Dedicated Asset Specificity

It has become clear that the existence of large pharmaceutical companies can, at least partly, be put down to the size of operations required to take pharmaceutical drugs through the FDA phases. This restricts major developments to a few large pharmaceutical companies. The transaction cost economics school defines dedicated asset specificity as investments in assets that are not in themselves particularly specialised such that the value of any particular asset is lower in any other use, but where the volume of the investments is such that the available markets have insufficient capacity to absorb the entire quantity. Consequently the sheer size of the company's development operations suggests that the dedicated asset specificity is high. Perhaps the most obvious example of sheer size is the clinical function within the development organisation, which is probably the main reason for the high cost of drug development:

> "biotechs and other companies have no capability of getting their good ideas to market, and they need us to do that for them."
>
> (R&D Accountant)

Dedicated asset specificity does not seem to be limited to the clinical function.

Process R&D also appears to have considerable operations within it's own specialist area.

> "We have discussed all these different organisational models, and obviously the virtual company or virtual department is one extreme. Our view is that there's enough of this (development manufacture skill type) externally to potentially replace everything we do internally, but there's not enough of this (analytical chemistry, process chemistry, and process engineering skill types) externally, so you couldn't put that outside, because (there is) simply insufficient capacity in the world."
>
> (Project Manager, Development)

This would seem to demonstrate that managers not only are well aware of the issue of capacity in the pharmaceuticals industry, but also shows that the extent of this capacity issue varies between functions and skill types within development (and potentially elsewhere). This opens up the potential to measure various forms of asset specificity at a lower level than the three organisations.

However this situation in the pharmaceutical industry may change. An interesting, and no doubt heated discussion in the pharmaceuticals industry, is the developing market in pharmaceuticals drugs prior to completion of all three stages of the Federal Drug Administration (FDA), that is to say, some interviewees noted that some notion of a market that places a value on drugs that have reached a certain stage is developing. Certainly the company does look at buying candidate drugs from small pharmaceutical companies, therefore any comparison with between internal control & external control is potentially open to change in the coming years. Both accountants and managers within DrugCo have noted the growth in the Far East, especially China & India, and the production excellence of manufacturers of off-patent drugs is not doubted.

"The Indian pharmaceuticals industry can produce drugs to an extremely high standard. Most of the drugs you buy generically in this country will probably come from India. The minute they're off patent they've got them produced to a very high standard, to FDA requirements and everything, we can't throw that out."

(R&D Accountant)

"there's the view there is increasingly becoming a market (for R&D), because if you look at people like the biotech's who have no distribution channels, ... they quite often take a product to a certain stage, and then either sell it, or co-market it, or co-develop it, or do something that enables them to get value from that product. So increasingly you're getting to a stage where if you looked at people who do a lot of licensing in the industry, they would say, a product that has come through phase one and two is probably worth 20% of final projected sales as an up front and a royalty of X%. So there's increasingly becoming sort of standard valuations, because there's going to be a market in the actual right to take the product to the next stage."

(Sales Accountant)

This suggests the relationships within DrugCo are open to change. However, considerable drawbacks still exist, most notably the risks involved in working with such companies concerning intellectual property rights and more generally sharing information. In summary it appears that the extent of dedicated asset specificity in the development organisation is considerable given the sheer size of operations in the clinical function.

6.7 Temporal Asset Specificity: Just-In-Time vs. Time in Projects

Temporal Asset Specificity has been noted by TCE researchers before (Williamson, 1985, find section), but this has referred to the importance of timely delivery of intermediate goods for Just-In-Time manufacturing where one party, usually the buyer, places itself in a vulnerable position whereby failure to deliver the goods on time by the supplier will cause production facilities of the buyer to cease due to a lack of materials.

Temporal asset specificity has proven to be somewhat different from the usual TCE definition of temporal asset specificity as arising from the dependence on the correct delivery of goods on time. Evidence from DrugCo suggests another way in which companies can put themselves in a vulnerable position as regards time. DrugCo's R&D is essentially based on a project based model. One obvious element of the project model is the time taken to complete a project.

As a pharmaceuticals company, DrugCo's development projects take seven years or more. This may be at the extreme end of the project lifespan of project models, but nevertheless, any significant time spent on projects represents an investment of time by a company. This is relevant to outsourcing considerations, since numerous parts of a project that could potentially be outsourced would themselves require a certain amount of time to be completed by the external party. This time again represents a form of investment by the original company in the transaction between the two parties. This investment is vulnerable to failures by the external company to complete the project successfully. If the contract is abandoned the company must either undertake the project themselves or contract out to another party, each of which entails another investment in time. It would appear that temporal asset specificity may be measured as the amount of time between contracting of project work and delivery of that work.

It would appear that temporal asset specificity is high both in the research &

development organisations, given both are subject to processes that require time to undertake & complete. This is reflected in the importance placed on time as a KPI is development.

> "For development its against really between how well and how fast you take this chemical to a marketable product (Speed of development). You don't do it quick enough then you wont make it."

(R&D Accountant)

6.8 Monitoring, Controlling & Exceptions

The time invested in projects with external parties is only part of the picture. Difficulty in controlling & monitoring external work has been raised as well as the risk exposure placed in external parties and the uncertainty regarding the requirements of projects.

Controlling projects that are being conducted either wholly or partly externally has been noted to be difficult. In particular controlling projects that are going wrong in some way appears to be a problem. This problem is not unrelated to the length of projects, but rather an integral part of the overall problem. The added complication is that success is not always guaranteed. Managers stressed the importance of being able to manage external work over the lifespan of the piece of work, most importantly being informed of difficulties that have occurred.

> "it's no good just saying, okay we've signed on the dotted line for a hundred kilos of material and we'll give you your money when it turns up, because that's disaster waiting to happen"

(Project Manager, Development)

> "There are other companies including small biotech companies, who aim to deliver the candidate drugs that we provide. But in ... when we try and analyse the costs, our belief is that it's much more cost effective to do it ourselves because we can control the balance of the portfolio for example, and we can stop things that don't look like they're going anywhere. Outside suppliers, either we buy the candidate drug after it's discovered, in which case the price tag is huge, or we ask an external group to go and do it, but then usually it's very difficult to rein that in if it's going wrong, or close it if it's not such a good idea. As internally we can make those decisions in a more direct way."
>
> (Research Manager)

The worst case scenario seems to involve external work that has run into difficulties, but the external party has continued to hide the problems up until the due date, at which point the company has the choice of waiting for the external party to solve the problems, or finding a new external party.

> "We've had instances where outside contractors had something go wrong, they think they can fix it so they don't need to tell us, but then X amount of time down the line they haven't fixed it, and then it's too late to recover the situation ..."
>
> (Project Manager, Development)

Monitoring difficulties can be measured as the difficulty in determining the successful completion of project milestones and detection of problems occurring in the project work. The preferred scenario as regards external project work is where the external party is willing to admit that things are not all going well when such problems occur.

> "So we try to build up long-term relationships with a relatively small number of contractors, who feel comfortable with admitting things aren't going well, or happy to discuss the project in a very open manner, so they're not giving away their secrets they feel we're going to steal."
>
> (Project Manager, Development)

Managers felt this was helpful since they could share in the problem solving processes, potentially sharing solutions. However managers also noted that such openness and sharing of information between companies required a relationship to be developed.

Moving on from monitoring & control problems, another problem associated with trust was noted, and alluded to in the quote above. The fear of infringement of intellectual property rights appears to be an issue in the development organisation:

> "I mean the real issue with these emerging countries is that they don't abide by patents, so having put work out there, you've got no guaranteed that that work stays inside the company. Put the work, and ends up being strung around all their mates in other places. So you know that's the issue with this, and couldn't go down the virtual company road."
>
> (Project Manager, Development)

Another problem with using external suppliers that was outlined by managers was the situation where the requirements are uncertain and prone to change. Thus another desire with some external relationships is where the external party is willing from the beginning to accept less than clear requirements, where the

contract can be changed easily, and for the external party not to penalise DrugCo for requiring changes.

> "Down side with external work is if you say, "I want this by then", that's exactly what you get. If part way through that you say, "I know I said I wanted this by then, well actually what I want is this, plus this other little bit of work ..."
>
> (Project Manager, Development)

For both the research and development organisations difficulty of controlling work over time is noted, suggesting monitoring problems exist in these two organisations. However, things appeared to be slightly better in the development organisation. Outsourcing is seen as possible provided communication channels are maintained. Risk is again an important issue in both organisations, although does not preclude external relations given the ability to set up long-term suppliers. Finally uncertainty is high in both organisations, but especially high in the research organisation given the high project fluidity in research. These external sources with whom relationships have been established demonstrate the existence of the hybrid forms of organisation noted by the later TCE literature (e.g. Williamson, 1991).

6.9 Corporate Awareness & Brand

The notion of brand has proven to be an interesting topic to explore, and would appear to be important within the development organisation. The company relies on the medical profession for access to patients, and the marketing operations for drugs in the US is for large pharmaceuticals companies considerable. The accountants recognise that economic concerns are not the only drivers for DrugCo's vertical integration. Image was stated as a reason for the company's extensive activities, and that the company wanted to be seen doing certain things.

DrugCo, in contrast to some pharmaceuticals companies, concentrates almost entirely on the discovery, development, & production of prescription drugs, and consequently the company does not sell to the public in many countries, indeed in many it is not allowed to advertise directly to the public (the US being the most obvious exception to this rule). Thus, the company does not target the high street consumer, but instead the company's image is directed towards the medical profession, which in large part is due to the need to inform and involve members of the medical profession in the development of drugs[54]. DrugCo wants to be seen to be part of the drug development processes, and as such feels the need to employ a large clinical function, fearing that external sources which could be employed in clinical trials will fail to have the same "passion" for the drugs:

> "at what point do you let somebody else handle your developed products, and be the front person to the outside world. Sure they'll use your name, but they're not feeling the passions for your product, they're just doing the job on your behalf."
>
> (R&D Accountant)

As suggested above, the word "brand" has proven to be contentious. One accountant preferred the term "corporate awareness". While this might be dismissed as word games, or the accountants association of "brand" with high street brands and their associated companies, it may be that more consideration should be given to this. In particular the concentration on the medical community rather than the public explains the preference for the term "corporate awareness".

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54 There is a need to explore the relationship between the clinical and marketing functions. It may be that clinical trials undertaken by the pharmaceutical companies are as much to do with informing doctors about the progress of candidate drugs as they are to do with getting FDA approval of the drugs.

Measurement, as ever, should not be considered any easy task, even in the relatively flexible environment of the interview, not least due to the likelihood that the interviewee is likely to be somewhat offended by the notion that DrugCo is a brand similar to McDonalds. The difference between the concepts of "brand" and "corporate awareness" was explained as deriving from the need to include the medical profession in the development of pharmaceutical drugs. There is a perception that the company needs to be seen to be part of the process of developing new drugs, to be seen conducting the clinical trials. Therefore we see that it is the focus of the asset that is the distinguishing feature, in this case the focus is on the medical community. At this time, only within the development organisation can a value be placed on corporate awareness. Hopefully future research will add some more flesh to this concept.

At least since Williamson (1991), the notion of brands as a form of asset specificity has been explored, where the management of brands by the bureaucratic controls of a company may be superior to the market. Brand asset specificity can be thought of as the value deriving from a brand that needs protecting from opportunistic behaviour that might be elicited from users of that brand. However, there are plenty of examples of brands, although owned by a central company, are used by many companies, the classical example being the McDonalds franchising system. But in the case of DrugCo it appears that brand considerations are important in explaining the size of the company, especially the inclusion of the clinical function.

6.10 Project Solidity

One of the most notable differences between the research and development organisations is the relative solidity of the projects. The attrition rate of projects in research was estimated by Henderson & Cockburn (1994) to be that only one in a thousand projects made it to the candidate drug stage.

By contrast attrition in the development organisation is that only one in ten

projects get from candidate drugs to prescription drugs. These differences in probabilities of success mean that the lifespan of projects are much shorter in the research organisation relative to the development organisation. This raises questions over the lifespan of relations and networks. In addition the bounds of a project are unknown, that is to say, the realised potential capabilities of a compound many change, and hence the aims of the project may change. The fluidity of a project can therefore be defined as a combination of the expected lifespan of a project and the likelihood of changes in the aims of the project.

Together the short life span and changing aims of projects in research makes for a stark comparison with development, where attrition is considerably lower, and clinical trails are directed towards a particular capability. The differing solidity/fluidity of projects has been put forward by the accountant for R&D as the main reason for the decision not to allocate labour costs to projects in research, but to do so in development. There is little point allocating costs to projects to research when it is hard to do so given the fluid boundaries, and when the projects are likely to die soon after. In contrast within the development organisation projects have much more certain goals and life spans tend to be longer.

6.11 Sourcing

6.11.1 Perceptions of Risk

Views on the risk associated with outsourcing seem to differ radically along the value chain of the organisation. Within the production organisation, the use of outside producers is seen as a way of reducing certain risk, especially the company's exposure to plant failure internally. Risk reduction is achieved by ensuring that production is spread geographically such that any failure at one plant can be taken up by another plant, including the use of external producers. Thus, the supply chain teams in production help to maintain a required production flow by mixing internal and external production sources. This

contrasts with the standard TCE approach that sees outsourcing as primarily a risky choice compared to using internal production when specific assets are involved.

The perception of risk associated with outside sources in production, differs somewhat radically with the position within the research and development organisations, where the use of external sources appears to be seen as relatively risky, and also the limited capacity of outside sources to make up for shortfalls in supply. As noted before, both fear of intellectual property theft and control problems stemming from the failure to fully disclose relevant information. In addition however, outside sources seem to have only a limited role in covering for internal supplies:

> "CRO's don't have infinite capability"
>
> (Development Manager)

This seems strange when compared to the notion given by managers that the company has a greater internal demand than internal supply for services. One possible explanation for what seems a paradox is that the available capacity from outside sources for the particular services needed in pharmaceuticals development is large enough to cover capacity shortfalls due to temporary fluctuations in internal demand, but not sufficient to match the sheer size of the internal capacity. Hence outside sources do not seem to have the same central role that they play within the production organisation. Overall then outsourcing is seen as risky in the development organisation, whereas in production there is more of what Williamson might call a hybrid organisation.

Within, R&D the outsourcing decision tends to be relatively decentralised, especially within research, based primarily on the grounds that the knowledge to make the correct decisions over the use of outside sources is held lower down in the management hierarchy. The company does have an outsourcing &

procurement department that establishes long term relationship with external suppliers, known as strategic suppliers. Project teams can include a representative from the outsourcing & procurement department, but the decision lies with the project team.

6.11.2 Reasons for Outsourcing

Enquires into the use of outsourcing of materials and services has commonly resulted in a number of recurring reasons for using such outside sources. One of these because the external company may have expertise in an area that DrugCo does not.

> "But there might be particular specialist areas of expertise, and I mean one example maybe is catalysis, were you know, yes we can do catalytic reactions, but there are other companies out there that specialise in them. So if you look at say hydrogenations which use catalysts, there's a hundred and one different catalysts, and knowing which one to pick is not always the easiest thing to do, there's a lot of black art in it as well as science."
>
> (Project Manager, Development)

> "But in some cases it can be very strategic which is they (an external party) have a reputation for being very good in particular ... theoretically we could say we're not very good at cancer, we've got this drug that's coming through, we've never been in it before."
>
> (R&D Accountant)

However, a lack of capability is seen as a secondary reason to outsource. The primary reason for outsourcing is where there is a lack of capacity. In other

words the company appears to maintain a greater capability than capacity, as evidenced from interviewees from the research, development, and production organisations respectively:

> "One where we have got a capacity issue (with) a particular activity at a particular time at the peak of activity, and a known somebody else has that type of capability, then we will go and get (it) externally."

(Research Manager)

> "... there's very little we have to go outside for, very little."

(Project Manager, Development)

> "Where there's either a financial or an operational or scientific reason, then to do, safety, or technical manufacture ability, we don't have the expertise in house, or the capacity in house, then we buy from outside."

(Supply Chain Team Member)

This suggests the industry may have a number of small companies who specialise in providing services to all the larger research companies. These companies may employ relatively low skilled workers. The make up of the smaller companies within the pharmaceuticals industry may be important[55].

55 For any interested researchers, consideration of the flexibility and skill levels between large pharmaceutical companies and smaller companies may be of interest. Are there two groups of small company in the pharmaceuticals industry? One group who specialise in relatively low skilled work but instead achieving some economies of scale from providing to all the pharmaceutical companies, and a second group who specialise in very specific high knowledge areas, but still not specific to any pharmaceutical company.

An interesting, and no doubt heated discussion in the pharmaceuticals industry, is the developing market in pharmaceuticals drugs prior to completion of all three stages of the Federal Drug Administration (FDA), that is to say, some interviewees noted that some notion of a market that places a value on drugs that have reached a certain stage is developing. Certainly the company does look at buying candidate drugs from small pharmaceutical companies; therefore any comparison with between internal control & external control is potentially open to change in the coming years. Both accountants and managers within DrugCo have noted the growth in the Far East, especially China & India, and the production excellence of manufacturers of off-patent drugs is not doubted. However, considerable drawbacks still exist, most notably the risks involved with such companies concerning intellectual property rights, and more generally sharing information.

6.11.3 External Selling

No notion of selling goods or services to external parties was found in production or development. This was explained as not being part of their model of operations in production, and due to the excess in demand for function services over supply in development. However, supplying to external parties was noted in the research organisation, as part of retaining relations with external parties, usually universities. This represents another potential issue in researching outsourcing in services.

6.11.4 Source Search & Sourcing Decisions

It has become clear that the function of sourcing search and the function of sourcing decisions are not necessarily located in the same place. Instead we see that the search for outside sources in development is located in two separate places. There are two different types of supplier found in the development organisation. The first type is the "strategic supplier". These are a relatively

small number of suppliers who have been extensively vetted by a separate "outsourcing & procurement" function in the development organisation. The company forms & maintains a long-term relationship with the strategic suppliers for the supply for materials & services, and in significant amounts. The development of such strategic suppliers seems to be done for a number of reasons. Firstly lowering prices for larger supplies of goods has been suggested, especially for supply later on in the project development lifecycle (for instance when large scale clinical trials are being conducted and there is a need for relatively large quantities of drug to be produced). Secondly being able to build up low risk. Projects teams within development interface with the sourcing & procurement function by having a member from the function on the project team.

The second type of supplier is the "tactical supplier". These are companies chosen not by the sourcing & procurement organization, but by those members in the project teams that belong to the respective function. Such tactical suppliers appear to be used for small quantities or quicker services than strategic suppliers, usually for work conducted at the earlier stages of development, where the quantities of chemicals needed are smaller. The relationship with such tactical suppliers does seem to be more complex than strategic suppliers, and to some extent represents a position between long term relationships and the classic spot market. While the amounts of money involved are smaller, and the importance of the success of the transaction are less, at the same time, project teams are keen to return to companies that have proved to be successful in the past, and it is claimed have an interest in ensuring such companies do not go under.

6.12 Accounting System

6.12.1 Timesheeting

The use of timesheets is one of the most noticeable differences in the accounting systems of the research & development. Scientific personnel in the functions fill in timesheets, in reality an electronic timesheeting system[56], which shows the number of FTEs demanded and supplied to a project, categorised by skill type. A cost for the Full Time Equivalents (FTE's) is allocated to projects at a standard rate. By contrast scientists in the research organisation do not fill in timesheets, with the notably exception of when they work on projects that have moved onto the development process.

The purpose of the timesheeting is two fold. Firstly it appears to be used to help maintain cohesion of the projects in development. The development organisation has a limited number of FTE's of various disciplines and those need to be rationed between the projects. Given the disparate nature of the organisation of the projects the timesheeting system provides a formal system to maintain cohesion. Project managers seem to think in terms of FTE's for projects, not the cost derived from the FTE's and standard costs. Within research, the closer proximity of project staff allows for control over personnel from a more intuitive sense. Secondly the timesheeting allows for a project cost to be generated for cashflow purposes.

> "(Project costs are calculated) In the short term for our control point of view so we have an idea of what the bill is going to be for the year for those projects, because ... projects do not produce

56 The system is based on the well known data warehouse system, Business Objects™. This allows managers to interrogate budgeting data on development projects across the company, providing project managers the ability to prioritise resources among projects. As already noted, the company uses an iterative handshake process to formulate budgets, including the external spend and FTE's, among the competing projects, and the data warehouse plays an important role in this.

> revenue for many years and we still have an income statement which the market expects today. On the other side its to test the NPV of the future product which is one of the portfolio determining factors."
>
> (R&D Accountant)

The standard cost covers not just salaries but many of the costs involved in employing labour. More interestingly this standard cost does not seem to be an important issue. Enquires to the accountant of the development organisation suggested that the calculation of the standard costs for each unit of labour are not a particularly important issue, suggesting the total cost of projects is not a particularly important issue.

6.12.2 Project Budgets

Project budgets in the development organisation consist of two components. Firstly as covered above, labour costs are allocated to projects via a timesheet system. Secondly external spend is allocated to projects, what is referred to as TA (Therapeutic Area) spend. Together, these two costs make up the total cost of projects that is calculated, and project management appear to regard project budget to consist of TA spend and FTE's (not the standard cost of labour). Thus the accounting system is assisting in the allocation of two scarce resources to projects. Capital is explicitly excluded from projects, partly due to the feeling that such costs can rarely be attributed to individual projects, and a feeling that such allocation might lead to incorrect decision making given the combination of the long life times of the capital & the "sunk" nature of the capital, or have no influence at all.

However, it should be noted, as hinted before, some capital costs are occasionally allocated when purchases are either unlikely to be used again, or the purchases, although probably would be used again, were still chiefly for the

project at hand.

> "If we do buy something which is relatively project specific, and it's a small cost, then we do allocate against that project, but then we can use it for something else"
>
> (Project Manager, Development)

However, this seems to be for small amounts, and one suspects partly due to "playing off" the capital expenditure budget with the budget for TA Spend.

6.12.3 The Importance of Project Costs

It has become apparent that the costs allocated to projects are not particularly relevant. From the perspective of decision-making, the decision to abandon projects is not based upon the costs that have been allocated to projects; rather projects are generally abandoned for one of three reasons. Firstly and most usually the drug does not work, they simply fail the drug trials or other tests. The second cause of failure is changing FDA rules. It should be remembered that candidate drugs take at least seven years to pass through the development phases. A candidate drug may, through the drug trials, exhibit side effects that while at the time of the trials are acceptable, are not acceptable at some point after the trials but before the drug has completed all trials. In effect drugs may fail due to "moving goal posts". Lastly a drug may be abandoned since another pharmaceuticals company gets it's competing drug through all the phases first. Once a drug is put on the list of prescribed drugs in any country, it is hard to get any other competing drug on to the list unless there are clear advantages in the newer drug. It was admitted that due to the open nature of the drug development process[57] regarding the position of drugs in the drug phases, the last possibility is very rare.

57 The drug development process is fairly open in that because discoveries can be patented they can be discussed quite openly.

A fourth possibility was suggested. Although most drugs can be manufactured at a price well below what the drug can be sold for, occasionally a drug will be in development that has a relatively low projected sales price and a relatively high projected cost of production per kilogram. The sales price and production cost per kilogram can be calculated relatively accurately, but the quantity of the active compound required for a single dose tends not to be known with any accuracy at the beginning. A project can start where the drug will be profitable if the quantity required remains relatively low. But if the quantity required turn out to be much higher than expected, the project will have to be abandoned. These occurrences are rare. Only one example was mentioned. More importantly it shows that production costs can be a reason for abandoning projects (if rarely) while development costs are not relevant.

Given the 90% attrition rate in development it is clear that the average cost of developing drugs is mainly driven by the cost of all the projects that fail. If management is interested in reducing costs, then the most important mechanism for doing so is to try ones best to select those projects that succeed. Given that the decision to move candidate drugs into the development process is a main board decision, this emphasis on choosing the winning projects is clearly evident.

6.13 Conclusion

The development chapter has proved to be a source of great interest. It represents, from an accounting perspective, an organisation that sits between the extremes of the research organisation and the production & marketing organisation. Project costs are calculated, but only partially. This makes for an interesting comparison with research where project costs are not calculated, and production where full costs are allocated to products. A fuller comparison is left to the final chapter, but we do see that the accounting system is used in development as part of the overall system for controlling the use of the limited

resources of labour hours (FTE's) and external spend among the development projects.

This is tied in with the strategy & structure of the organisation. The disparate nature of projects, spread among four different functions, would appear to require formal systems to maintain cohesion. In research, project use of labour appears to be controlled more directly by management, without exact figures of hours worked on each project. That projects are confined to individual RA's should make this practical, but this would be unworkable in the matrix of the development organisation.

Chapter 7 Production & Marketing

7.1 Introduction

The last organisational unit in DrugCo that we will cover encompasses the production and marketing operations. These are to be treated as a single unit in this analysis, since the accounting systems are integrated along the value chain, that is the costs of production are transferred to the marketing operations.

In this chapter we will uncover some elements of the strategy & structure of the operations, but more importantly see the last links into three of the stories we have been covering in the previous two chapters.

It will be see that the sourcing decisions follow the pattern established in the previous two chapters, association with the levels of asset specificities, and the level of uncertainty. Furthermore, it will be seen that the costs allocated/transferred are again associated to the structure of the organisation. Finally, it will see again the relative nature of cost as a performance measure.

7.2 Structure & Strategy

The structure of the production function within DrugCo is organised as a set of sites spread over numerous countries and separate legal entities. This spread between countries and legal entities has a significant influence on the transfer prices between sites as discussed later. However this is a simpler structure than the matrix found in the development organisation. None of the sites operates as a profit centre.

> "In terms of treating our sites as a profit centre we don't do that, so in that sense transfer pricing is taken out of the performance measurement equation."
>
> (Production Accountant)

Cost is therefore the main financial factor, but as we will see, financial factors are not directly the main concern of the production organisation. From a strategic perspective the sites within production operate to meet the demands of the marketing companies within DrugCo, rather than simply concentrating on maximising the utilisation of the production assets. It is the focus on meeting the demands of the marking companies that drives production.

> "The nature of the business is that we're geared to producing products that we have patents for, and we want to exploit those patents right up to the end of their lives, and beyond if possible. We see it as our core role as DrugCo operations ... our role isn't to maximise the use of our assets in that sense, it's to make the products the marketing companies within DrugCo can sell. There might be the odd exception to the rule, but that's not the way we operate."
>
> (Production Accountant)

7.3 Physical Capital

7.3.1 Plant & Equipment

Physical asset specificity is not particularly high in production. As a member of the supply chain team noted when asked whether the assets in the factories could be used for other purposes

> "Oh, absolutely, it's just pots and pans at the end of the day."
>
> (Supply Chain Team Member)

This point was more fully expanded when talking to a manager within Process R&D who knew about the development of the production processes.

> "In theory for us our assets could be used by anyone else in the pharmaceutical industry that wanted the ability to make a plant, or could be used more widely by the chemical industry, so ICI could use them in theory, or the contract chemical industry. But we don't use them for anything else other than making DrugCo development products. But they're not proprietary technology where, you know, we've got something that absolutely nobody else's got, and what we've got chemical plant that's been bought from chemical plant manufacturers that we might have bolted together in a specific way to suit our purpose, but it's general plant bits, kit. What potentially gives us any advantage over the competition is, A, how we manage and use those facilities, and B how, well, cleverly we develop the processes that actually run inside them."
>
> (Project Manager, Development)

Thus although there is nothing special about the basic equipment there is a certain competitive advantage obtained from the manner in which it is used.

7.3.2 Compliance with Regulatory Standards

One of the most important issues raised regarding the use of the chemical plant for production is the need to ensure plant is maintained to a high quality to meet compliance of the different regulators.

> "So you might have a packing plant somewhere that has spare capacity that would be going almost touting for business, it's not just it's marketing companies ... the only thing I can think of is the caveat that would be the compliance issue. If you're packing happily for Spain, and you want to do some packing for say some North African markets, there may be a completely different set of regulatory authorities that you have to satisfy, and it's not just a question of filling up the capacity, it's making sure you comply with all local regulations."

(Production Accountant)

Setting up a plant to comply with the regulations for producing a certain chemical or drug is an investment that is subject to risk if the plant needs to be reconfigured for another drug or chemical, that in turn requires further efforts to ensure compliance. Therefore, it is likely that set-up costs for any individual plant are significant; consequently there are competitive advantages in avoiding such changes in production.

7.3.3 Cross-contamination

A third factor limiting the use of physical assets is the need to ensure there is no cross contamination when a new product is manufactured on existing equipment. It was noted that to change a piece of plant from producing one chemical to another was not easy due to the danger of cross-contamination.

> "one of the biggest issues we face in the pharmaceuticals industry is the prevention of cross contamination ... some equipment it's possible it would be kept dedicated"
>
> (Development Manager)

Again, as with ensuring compliance with regulatory requirements, setting up a plant to produce a particular chemical to the level of purity required in the pharmaceuticals industry represents an obvious investment by a production facility. This investment will be lost if the chemical is no longer demanded and the plant needs to be set-up for another drug. Again, a competitive advantage will exist for any company that can minimise changes in production. The existence of regulatory concerns and cross-contamination, and to a lesser extent the knowledge put into setting up production facilities for particular drugs, results in potential set-up costs. These set-up costs suggest the need for protection, of which internalisation is one solution. Overall we can see that plant is likely to be set-up for particular drugs and to comply with particular regulatory bodies (mostly likely for a distinct set of countries).

7.4 Asset Specificity

7.4.1 Limits to Flexibility of Physical Assets

We have already discussed the inflexibility of physical assets, stemming from the need to comply with regulatory bodies, the need to ensure against cross contamination, and the particular way plant is set up. This in turn suggests a modicum of physical specificity, including a certain geographical inflexibility where shifting production from one country to another may be problematic, further suggesting site asset specificity. Nevertheless the level of asset specificity overall is modest, as will be seen below.

7.4.2 The Competitive Advantage of the Physical Asset Specificity & the Supply Chain Teams

The supply chain teams plan sourcing of products from both internal and external manufacture, and need to consider the risks involved in meeting time, and ensuring regulatory and quality targets are met from internal and external sources. The ability to manage the inherent flexibilities while at the same time supply consistently and on time is one of the main competitive advantages of the production organisation, stemming partly from the activities of the supply chain teams who maintain carefully constructed supply chains, and partly from the activities of the production sites in maintaining the compliance with the regulations and the high quality standards.

7.4.3 Dedicated Asset Specificity

In addition, as already noted in the development chapter, the pharmaceuticals industry in the Far East, it appears, is able to produce substantial volumes of prescription drugs when they go off patent. This suggests that although the production capacity of DrugCo is substantial, the extent of dedicated asset specificity is probably low; that is to say, the pharmaceuticals industry may be

quite well able to absorb the capacity of DrugCo's production. Thus we may conclude that the extent of dedicated asset specificity (mainly for physical assets) is also likely to be relatively low.

7.4.4 Site Asset Specificity

As noted in the "Cross-contamination" section above, site asset specificity is moderate given the inflexibility of the physical capital, in particular the existence of regulatory concerns. This suggests a link between site and physical asset specificity. However, given that the central supply chain teams are able to co-ordinate production flows and no indication of any transport difficulties, the importance of close proximity of production is of only moderate importance.

7.4.5 Temporal Asset Specificity

In previous two chapters, temporal asset specificity was found to be different from that which currently exists in the TCE literature (Williamson, 1991). The outsourcing of project style work, such as that carried out in the research and development organisations, was seen as problematic. Time itself was the investment in these cases, and if work failed externally that investment was in jeopardy, and was also open to the potential of increasing time delays if problems were not detected and solved early. Relationships with tactical & strategic suppliers were maintained, suggesting some evidence of the hybrid organisations noted by Williamson (1991). In the case of the production organisation, the more traditional TCE definition of temporal asset specificity as arising from the dependence on the correct delivery of goods on time, usually as part of a "Just-In-Time" production system, seems more appropriate. Here the investment is the cost in delays further along the value chain. The different natures of temporal asset specificity make comparison between the levels of temporal asset specificity within the research & development organisations and the production organisation problematic. The existence of supply chain teams suggests that timing is important, but not so important that it was actually raised

by supply chain team members interviewed when the problems of outsourcing were raised. Instead as already noted, compliance with regulatory controls was stressed as being of the greatest concern. Additionally, outsourcing was not seen as inherently risky. The supply chain teams, it appears, are able to share the load of production among different sites, reducing the exposure of the value chain to failures of any particular plant, whether internal or external, to supply on time. Thus a tentative moderate level has been put here, but more research is needed here, along with more research into the vexed question of whether temporal asset specificity from production environments can be compared with that in project style environments.

7.5 Risk

Perhaps one of the greatest reasons for continuing to keep a considerable amount of production capacity within DrugCo is the risks perceived in using outside parties, especially in those chemicals & pharmaceuticals companies in the Far East. The fear of infringement of intellectual property rights appears to be an issue in both the development and production organisations:

7.6 Sourcing

The production organisation buys goods & services from external parties chiefly for three reasons. Firstly when they do not have the expertise to supply these in house, secondly when they don't have the capacity internally to meet the internal demand, and lastly to reduce risk.

> "(We buy chemicals from external sources) where there's either a financial or an operational or a scientific reason, ... where we don't have the expertise in house, or the capacity in house, we buy from outside ... the other thing is that the supply chains, depending on the stage of the product, the size, etc. we'll try and cover risk.... where we've got really critical stages of production,

we wouldn't just have one place were we get that from, we try and design it so we have two, in such a way if one, you know, if a bomb drops on it, or a plane crashes, we're covered. Or if an earthquake happens or, you know like the Danube floods, we've got contractors who ... anything can happen, so what we try and do is share the risk around, not necessarily for financial reasons and that in the short term, but for this reason."

(Supply Chain Team Member)

7.6.1 Perceptions of Risk

As shown in the quote above, use of outsourcing appears to differ in production from research or development in the perception of the risk associated with using outside sources. Within production the use of outside sources is seen as a way of reducing certain risks, which is in contrast to the standard TCE approach that sees outsourcing as primarily a risk choice compared to using internal production. Within the production organisation, the use of outside producers is seen as a way of reducing the company's exposure to plant failure internally, such that if a plant at one location stops producing, other plants, including external producers can fill the gap in production. Thus the supply chain teams help reduce the risks and maintain the required production flow by ensuring that production is spread between different plants, from both internal and external production sources, such that a failure at one plant can be taken up by another plant.

This differs radically with the position further back in the value chain. In the research & development organisations the use of external sources is seen as relatively risky. Although it was noted that there was a need to use outside sources when the required expertise or capacity was not available internally, they also tended to emphasise the greater risk in using outside suppliers. As noted before, both fear of intellectual property theft and control problems stemming

from the failure to fully disclose relevant information. In addition outside sources were seen to have a limited role in covering for shortfalls in internal supply since external suppliers were seen to have a limited capacity.

> "That's (covering risk) a very valid reason that you know for a very big company, you know we've got six separate R&D facilities for pharmaceuticals ... I suspect ... sourcing of key ingredients might well come from more than one source precisely for that reason ... but it's one of those areas where it's not simple ... CRO's (contract research organisations) don't have infinite capability ... you see another reason for using CRO capacity is you see it's very expensive for us to hire people and even more expensive for us to fire people, so as capacity fluctuates, it's very hard for us to work around that fluctuation, we're not a hire and fire organisation, it's just not the nature of our business ... we tend to use CRO's for that aspect of it ... (but they put) pressure on us to give them better forecasts, because they don't like hiring and firing, it's difficult and expensive for them as well. So it's not simple."
>
> (Development Manager)

This seems strange compared with the notion given by managers in development that the company has a greater internal demand for, than internal supply of, services. One possible explanation for this paradox is that the available capacity from outside sources for the particular services needed in pharmaceuticals development is large enough to cover capacity shortfalls due to temporary fluctuations in internal demand, but not sufficient to match the sheer size of the internal capacity. One suspects that fluctuations are in demand rather than supply. Hence outside sources do not seem to have the same central role compared to the role in which they are placed within the production organisation. Overall therefore outsourcing is seen as risky in the research &

development organisation. Within the production organisation however, the available capacity externally seems to be greater, and the role of the outside suppliers seems to be integrated into the production models used. Certainly back in the development organisation we saw that some functions could potentially be completely outsourced from the perspective of there existing sufficient capacity externally to supply the requirement, whereas with other functions the external capacity does not exist.

> "We have discussed all these different organisational models, and obviously the virtual company or virtual department is one extreme. Our view is that there's enough of this (development manufacture) externally to potentially replace everything we make internally, but there's not enough of this (analytical chemistry, process chemistry, process engineering) externally, so you couldn't put that outside, because there is simply insufficient capacity in the world."
>
> (Project Manager, Development)

7.6.2 Sourcing Decisions

As noted above outsourcing within the production organisation is heavily centralised with a supply chain function that coordinates the routing of materials & intermediate products between plants, including from outside sources, across legal boundaries, and national boundaries. When a member of the supply chain teams was asked whether the decision making process regarding the design of the supply chains was centralised they gave the following answer:

> "Definitely. The decision making process as to where to site the different parts of the supply chain, yes."
>
> (Supply Chain Team Member)

The discretion to buy materials from external sources, at least with key materials, does not seem to rest with individual plants. This appears to be part of the overall model of operations within production & marketing, which is to produce & sell the prescription drugs owned by DrugCo.

This contrasts quite surprisingly with the location of sourcing decisions within the research & development organisation, where decisions tend to be relatively decentralised, especially within research, based primarily on the grounds that the knowledge to make the correct decisions over the use of outside sources is held lower down the management hierarchy. What we can see is a general tendency to decentralise sourcing decision the further we go back along the value chain of DrugCo. In addition the sourcing search function and the sourcing decisions in production appear to be made in the same location, in contrast to the development organisation.

7.6.3 Licensing Decisions

It was noted that the sourcing of chemicals for production is a relatively unimportant issue for the company as a whole (as is possibly production in general). Instead the purchasing of licences to make prescription drugs is considered by some to be a far more important issue for DrugCo, and this is handled by a separate organisation within DrugCo.

> "Do we manufacture an NCE, new chemical entity, or will we buy it already processed from somebody else. It's quite far down the value chain, it is a very small component of the value chain ... do you licence products in or do you do your own research. Those are much more fundamental decisions"
>
> (Sales Accountant)

7.6.4 External Selling & External Buying by Marketing

As with the research organisation, some notion of selling to outside parties was found.

> "It tends to happen (selling externally) where we're divesting a product, and there's a transition period of two or three years between us owning and marketing and distributing a product, sell it to somebody, and then two or three years we continue to make it, then we sell it to them outright. It can't happen overnight, we continue making it, and sell it off as a sort of commodity."
>
> (Supply Chain Team Member)

However, this is, as with the research organisation where supplying to outside parties was conducted only as part of retaining relations with external parties, usually universities, this external selling is not an integral part of the organisation's strategy. When asked if product was sold to outside parties whenever there is an excess in supply, an accountant in the production organisation gave the following answer:

7.7 Accounting System

7.7.1 Transfer Prices, Cross-Charging, & Centres

Any investigation into the transfer pricing issue must untangle the organisational decisions making & controlling aspects from the tax aspects. Transfers from one site to another occur at cost, except in two cases. The first case is where the transfer crosses an international boundary from one tax authority to another where a profit component is added. The second case occurs in some tax authorities, such as France, where they require transfers from one legal entity to another to include some measure of profit in the transfer price.

> "We've got three or four legal entities in France which all sell goods between themselves, they I believe would have some kind of transfer pricing arrangement, but we also have got something like Germany, where there's two physical units that transfer goods, but there's no transfer price there, it's transferred across at cost. There's no artificial transfer price created. It makes sense. Between legal entities, yes, within a legal entity, not as a rule ... To flesh it out with an example, if you have a product that was a bag of bulk tablets, a thousand tablets, that were made in Sweden, that would get sold to another country for final packing, would resell to the final market. So if it went to France for example, the French final packing site is a different legal entity to the French marketing, so potentially there's two transactions there, from Sweden to the packing site, from the packing site to the marketing company, that's three separate legal entities, even though there's only two countries involved. If it was Germany you might get a product which was going from Sweden to a packing site in Germany, and then on to the marketing company. In Germany they're the same legal entity, but it seems to suit the German set-up locally if you like to actually sell that on, but there's no

> transfer price, it's just passed on at cost. It's almost like a processing cost the French packing site charge the marketing company for it's packing activities, so it has to take a profit, because the French tax authorities won't allow them to do otherwise."
>
> (Production Accountant)

Although some profit mark-up is required on transfers in these two scenarios, through interviews with the accountants in production and marketing it appears that DrugCo has to some extent successfully kept the accounts used for decision making and performance measurement separate from the accounts for external reporting and the accounts used for taxation issues.

> "We do our accounting in two completely different ways, we've statutory accounting, we've management accounting. Statutory accounting as you know its transfer prices cross-border, management accounting completely take that out, add it all back, and work on actual costs of the business. So any thing I'm reportable for, ignores for example full products coming from Sweden, will reverse that profit made in another unit, to try and get it back to original fixed manufacturing costs."
>
> (Sales Accountant)

It should be noted that the term "transfer pricing" in DrugCo, and possibly in other companies, has come to be associated with the taxation issue and the need to include some profit mark-up in transfers for the purposes of tax requirements. The notion of including a profit change in transfers for the purposes of internal control and performance measurement is known in DrugCo as "cross-charging", an activity that numerous accountants at senior levels and in the organisations claim does not occur. The notion of profit centres & cost centres does appear to

be well understood, and is associated with the notion of "cross-charging". This suggests that future investigations to distinguish between transfer pricing for tax requirements and transfer pricing for internal control should inquire first into the use of cost and profit centres.

Transfers, aside from the profit mark-up required in the above scenarios, are at full manufacturing costs, which includes direct manufacturing costs, overheads, depreciation, etc. It is also claimed that activity based costing (ABC) is used. Although the level of sophistication of the cost allocation was not investigated, we can conclude that capital costs are being allocated at some level of sophistication and included in production costs and transfer prices, which differs from the research and development organisations where capital costs are not allocated to project costs. Thus we can conclude that in the more traditional environment of manufacturing & marketing, where asset specificities are lower and the environment is more certain, just as the development organisation allocated labour costs to projects at standard rates, costs are transferred within production & marketing at standard costs.

The last point to be made is that R&D costs, the costs of projects, are not transferred from development to production.

> "As far as R&D is concerned they work totally as a cost centre not as a profit centre, so I have no allocation made against what I'm reportable to for R&D."
>
> (Sales Accountant)

The use of full costing techniques within the production organisation has raised some of the more classical complaints regarding such costing. In particular the allocation of sunk & fixed costs has been noted as creating dysfunctional decision-making. For instance certain plants are preferred over others because they are older and thus most of the capital costs have already been fully

depreciated, thus producing at a lower cost even though the manager feels use of the more modern plants is likely to have more effective results. The marketing side also noted that there was pressure to continue unprofitable products since they absorbed fixed costs that would otherwise be allocated to other products.

7.7.2 Key Performance Indicators & Performance Measurement of Production Managers

As with the research and development organisations, multiple key performance indicators (KPI) are used in production, and as with those organisations, the KPI's can be ranked in importance. The most important KPI's relate to the need to be compliant with government and other external regulators. Without compliance there would be no point in manufacturing any drugs. KPI's related to customer service appear to be the second most important measures, and finally cost measures and stock management KPI's are included.

> "The basic licence to operate is one, being in compliance and so on, because with the pharmaceuticals ... there so much emphasis on being compliant with all the regulators, that we've basically got to supply products to the right regulatory standards, so that's ultimately, you know if you can't do that there's no point in have any kind of costs. Second is kind of customer service, and then things like costs, stock management, go into there as well."
>
> (Production Accountant)

Cost measures are still seen as important, but their relative position is only third in the ranking. This, as was found in the research organisation, demonstrates the relative nature of the importance of cost. Questions that ask whether cost or other financial measures in any absolute sense are likely to illicit answers contrary to what might be expected. Furthermore, again as was found in the research organisation, the KPI's change over time, every year new KPI's might

be added, old measures removed, and the relative position of measures might be changed.

Some accounting researchers have come to note with some concern the large number of KPI's that can appear in performance measurement reports, but I think to some extent this concern is partly unfounded. Accountants are aware of the problem, but the KPI's appear to be, if unofficially, ranked, and this ranking can change to fit new circumstances & priorities. Some KPI's will remain in the reports, but will be generally ignored except when they are needed. The continued measurement & reporting of KPI's that are occasionally used is not to be feared since management itself will filter these KPI's until they are needed.

7.8 Conclusion

The simpler and more traditional structure of the production and marketing is associated with a traditional management accounting system, if with relatively modern extension such as ABC. This further underlines the close linked between strategy, structure, and the accounting system that was found in the previous chapters and organisations. Sourcing decisions, contrary to what might be expected in transaction cost economics, are centralised in this environment. The levels of asset specificity, and more importantly the perceived risks in using far eastern manufacturers, means that large amounts of the manufacturing is conducted internally and is mandated. The knowledge required to make sourcing decisions, unlike further back along the value chain, appears to exist high up enough in the organisation for sourcing decisions to be centralised. Finally the relative nature of cost in performance measurement has been further underlined, and cost is also shown to be more important where asset specificity and uncertainty are low.

Chapter 8 Findings

8.1 Introduction

Throughout the last three chapters a number of different but interrelated stories have begun to emerge. In particular a rather complex story has emerged regarding the strategies and structures within the company. Although this story still contains areas of uncertainty, enough evidence exists to formulate several hypotheses regarding the nature of strategy within single companies, and the factors associated with strategy. In addition three other stories stem from this core story. As already suggested in previous chapters, the cost allocation and sourcing stories are linked to the structure and strategies adopted by units. Finally information regarding use of cost in performance measurement was uncovered.

8.2 A Note On Structure and Terminology

DrugCo uses it's own terms to name the parts of the company, such as "organisations" for the research and development. The immediate subunits of the research organisation are the research areas or RA's. The immediate subunits of the development organisation are the functions such as Process R&D and Clinical on one axis of the matrix structure, and the therapeutic areas or TA's on the other axis. The structure of DrugCo is summarised in illustration 8.1.

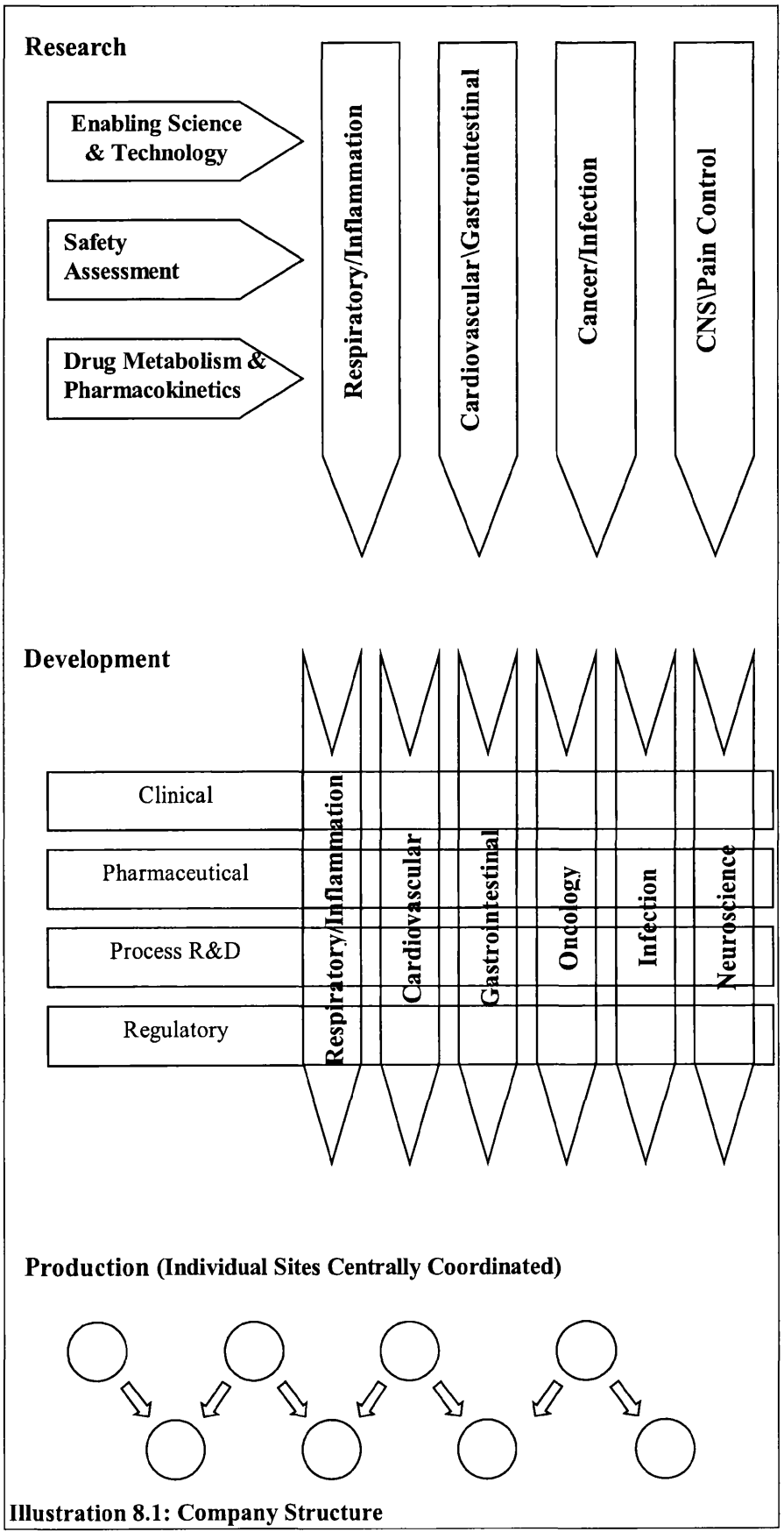

Illustration 8.1: Company Structure

However this study is not meant to be a descriptive study, but is instead an exploratory study that aims to generate theories that are applicable to other cases. Therefore the use of the company's own terminology in the construction of hypotheses is undesirable. Instead we will borrow the standard terminology used to describe the relationships between nodes within a hierarchy, namely parent units, child units, and sibling units[58]. For instance when describing the relationship between the overall company and the research organisation, the company is the parent unit and the research organisation is the child unit. When describing the relationship between the research organisation and one of the research areas, the research organisation is the parent unit and the research area is the child unit. When describing the relationship between the research organisation and the development organisation, each organisation is the sibling unit of the other, and likewise the RA's are the sibling units of each other.

58 For instance, the World Wide Web Consortium's (W3C) Document Object Model (DOM) uses this terminology to describe the relationship of objects within a web page.

8.3 Strategy & Structure Story

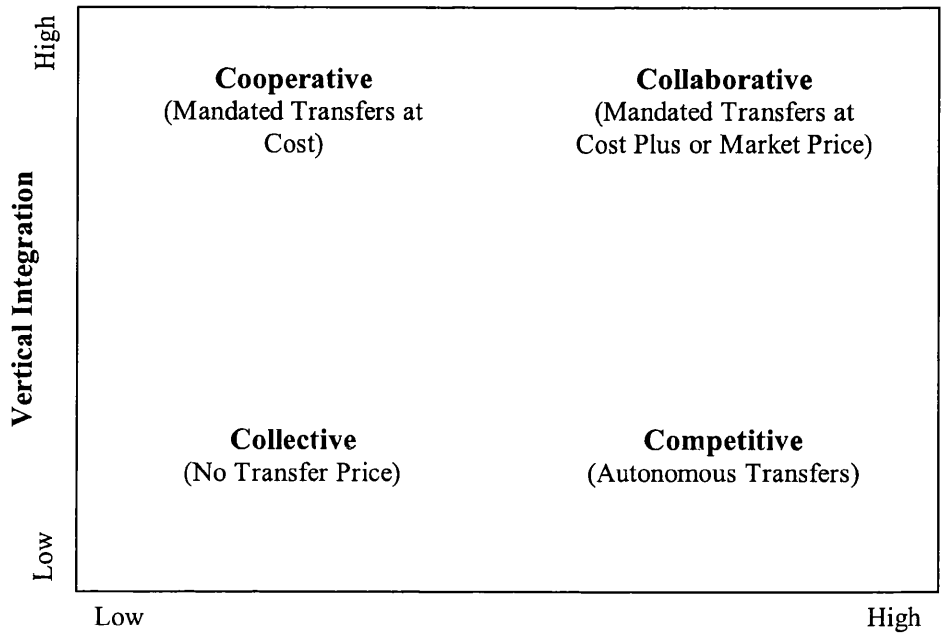

Illustration 8.2: Eccles' (1995) Managers' Analytical Plane (MAP)

DrugCo has chosen to follow a strategy that separates it from other large pharmaceuticals companies, namely the decision to operate almost exclusively on prescription drugs means the company has chosen a lower level of diversification than other pharmaceuticals companies which operate not only prescription drug lines but also consumer health care products[59]. Vertical integration is high, in particular the company operates a long value chain from early stage research with chemical compounds, through the development of candidate drugs that involve the Federal Drug Administration's (FDA) phases, to manufacturing drugs, including the sales & marketing, up to and past the patent's expiry date. Thus, we can conclude that DrugCo has an overall strategy of high vertical integration and low diversification.

From the perspective of Eccles' (1985) Managers Analytical Plane (MAP), see Illustration 8.2, we can place DrugCo in the top left quadrant as a "cooperative"

59 For instance, in 2004 consumer healthcare accounted for 16% of GlaxoSmithKline's turnover.

form of firm, and consequently the company would be expected to have mandated cost based internal transfers with no profit mark-up between cost centres. Profit centres are not expected to exist, except at the end of value chains. From what we have learnt from the previous three chapters, this does apply to DrugCo. There are no profit centres in the company[60], transfers do not include a profit component, and internal transfers are protected in various ways. Thus, the association between strategy & structure that Eccles' framework predicts was found in DrugCo.

However, as we have learned in the previous three chapters, DrugCo has differentiated its operations along its value chain into at least three major child units. All these three child units follow DrugCo's overall strategy in that they are all part of the integrated value chain from research to marketing, and there is little work conducted that does not form part of the prescription drug business. Nevertheless, contrary to some expectations, but in line with the work of Lawrence & Lorsch (1967), the units due to their different positions along the value chain have different objectives, and to achieve those objectives they all have chosen distinct strategies and different internal structures. Thus the strategy of the company is not homogeneous, but rather the overall strategy of the company is open to variations at lower levels. Integration of these child units appears to be at a number of levels. Movement of candidate drugs into the development stages is a board decision, yet information and personnel are shared between the research and development units. The strategy & structure of the company (the parent unit) and the strategy of the three child units is summarised in Illustration 8.3. What should be noted is that this Illustration gives a picture of the first two layers in a multi-layered story, which will be elaborated upon further.

60 A note of caution should be added here. So far the concepts of cost centres and profit centres appear to be understood by accountants and managers to refer to internal control. The need to add a profit component to transfers that crossed tax authority boundaries (usually country boundaries) was found, but no notion of accountants or managers perceiving that to constitute a profit centre was found.

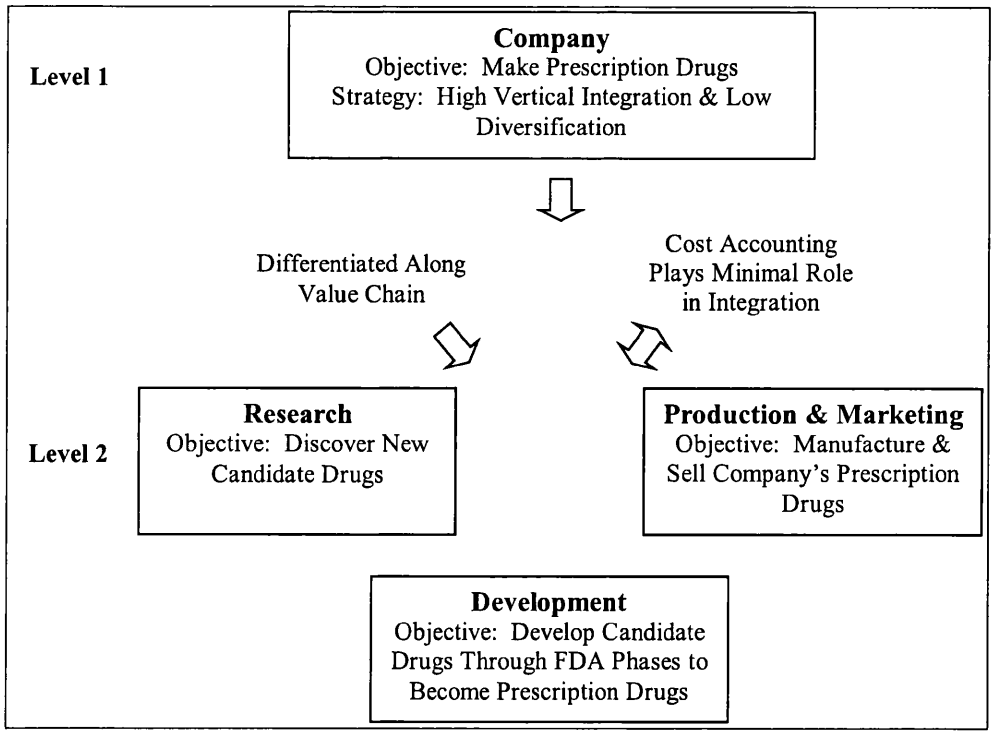

Illustration 8.3: Objective and Structure at Levels 1 & 2

The objective of the research unit is to produce candidate drugs for its sibling unit development. As we will see later in the cost story, the cost of producing those candidate drugs, while it cannot be dismissed as unimportant, is nonetheless smaller compared to the costs of development. In the research unit, the emphasis appears to be on producing top quality candidate drugs, those that have the best chances of successfully passing through the three FDA phases in development. The unit has chosen to differentiate itself essentially by diseases (by product), thus we see a hierarchical unit with four distinct child units known as Research Areas (RA), scientifically multi-skilled units, with a range of scientific disciplines such as chemistry and biology, that concentrate in particular disease areas. There appears to be little horizontal integration between the RA's judging by managers' complaints about poor information sharing and little sharing of personnel judging from managers' stories regarding the retraining required to move over to other research areas. There are three units that service the RA's, but unlike the therapeutic areas (TA) in the development unit, the bulk of the personnel sit in the RA's. Using a combination of Eccles' strategic

dimensions and Henderson & Cockburn's (1994) distinction between specialisation in diseases and scientific disciplines, it was found that diversification can be seen as two separate variables; firstly diversification of disease areas, and secondly diversification of disciplines (usually scientific disciplines). When applied to the research unit, we see that the differentiation by this unit means that each RA concentrates on certain disease categories, that is each RA operates a strategy of low disease diversification. This is summarised in illustration 8.4.

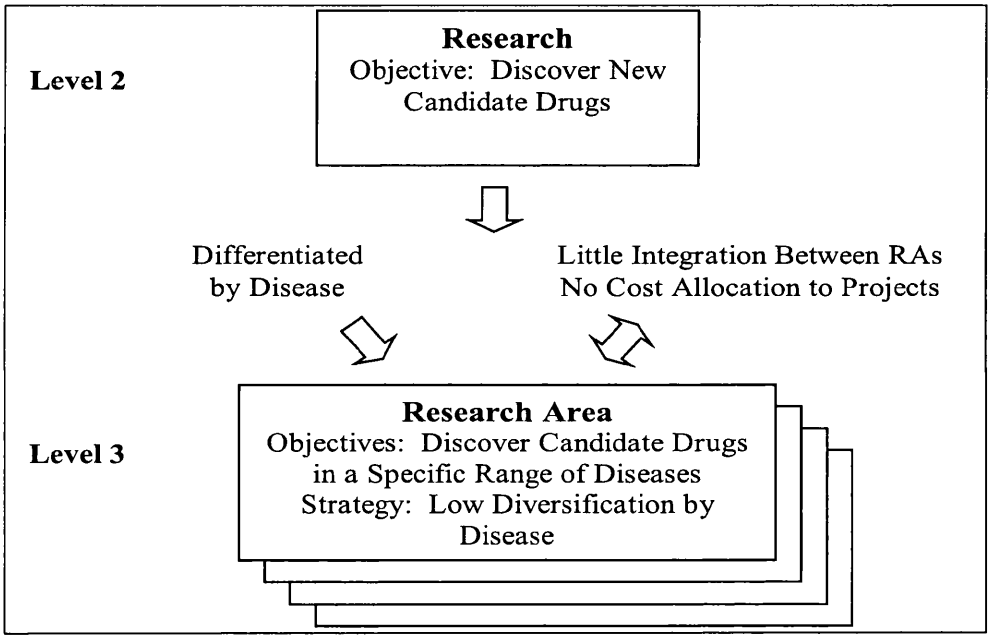

Illustration 8.4: Objectives, Strategy and Structure within Research at Levels 2 & 3

Therefore we have a story similar to that found before. A parent unit has a certain set of objectives and has chosen a strategy to achieve those objectives. It has differentiated its child units such that each child unit has a different set of objectives from its sibling units. Nevertheless each subunit's objectives aim to help achieve those of the parent unit. Or put another way the objectives of the parent unit form boundaries of the objectives & strategies of the child units.

The development unit is tasked with the objective of passing the candidate drugs

through the three stages of the FDA drug development process. These stages represent the standard benchmarks of prescription drug development in the industry, and are usually found in the annual reports of the pharmaceuticals companies. Costs, as we will learn later in the cost story, are much higher here, and efficiency in cost and time are more important. The structure chosen by the development unit is almost diametrically opposite to that found in research. The development unit has differentiated itself by technical discipline, thus we found four functions that specialise in particular disciplines rather than disease areas and where integration is geared towards groups of similar disciplines.

Thus again we see that the way in which operations are differentiated impacts upon the objectives and the extent of diversification of child units. Unlike the research unit, integration between child units is achieved through a matrix structure based upon a hierarchical project team management[61]. This is summarised in illustration 8.5.

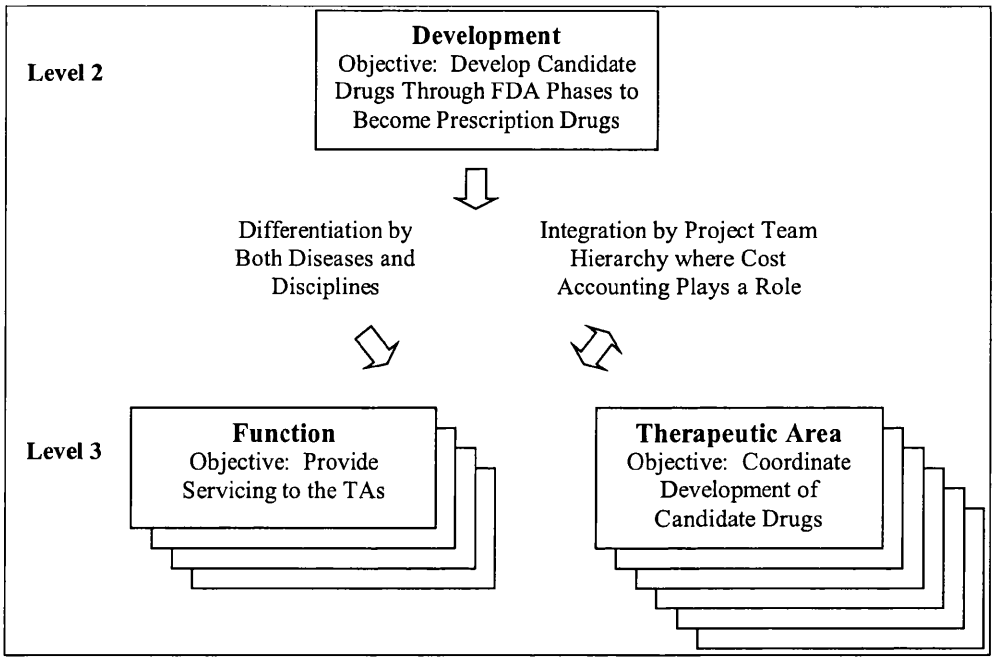

Illustration 8.5: Objectives, Strategies and Structures within Development at Levels 2 & 3

61 See Illustration 6.4, The Project Team Hierarchy (The Turtle Diagrams).

However the story is more complicated. In chapter five on the development unit a more fine-grained set of strategies and structures was uncovered. The strategies and structures differ between the development unit's functions. Some functions have maintained "full toolkits" where each site retains the ability to cover all disease areas, which is achieved by coaching roles to help maintain equal capabilities among skill types at different sites, suggesting that each site retains high diversification as regards disease areas. This is summarised by illustration 8.6.

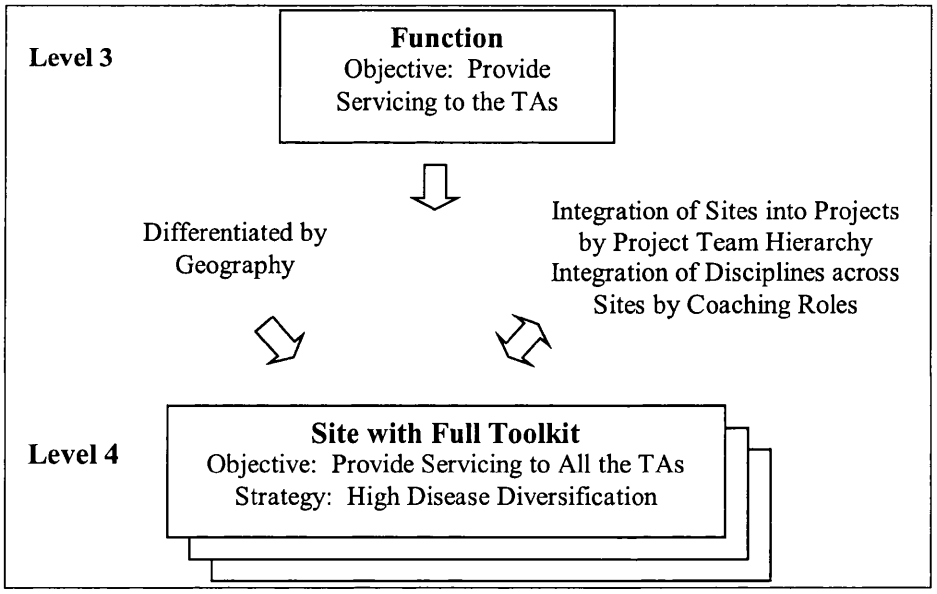

Illustration 8.6: Objectives, Strategies and Structures within Development Functions with Full Toolkits

Conversely, some of the functions have chosen to operate "centres of excellence", where sites concentrate on particular disease areas or technologies, so that these sites have low diversification as regards both technical and disease area variants of diversification (summarised in illustration 8.7). This suggests that there is little integration between sites to maintain a capability for all disease areas. Thus some functions are following a strategy of ensuring their sites are diversified. Therefore we see two different strategies, one with high disease area diversity, and another with low disease area diversity, yet both apparently

consistent with the objectives of the development unit.

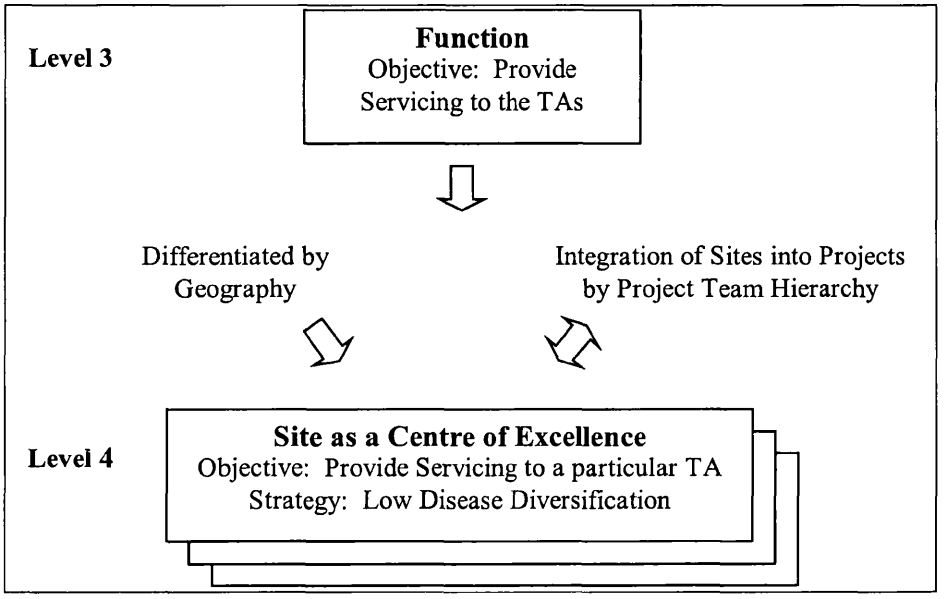

Illustration 8.7: Objectives, Strategies and Structures within Development Functions with Centres of Excellence

The production and marketing operations are from a strategic and structure perspective far simpler than that found in the development unit. The objective of the production operations is to manufacture DrugCo's prescription drugs, where the accountants place emphasis on quality and compliance over cost. Evidence suggests that the production unit does not show the rich variation in strategies found in the development unit. A more traditional structure and accounting system is found, where centralised supply chain teams achieve integration of production flows.

We have seen a multi-layered organisation, where at three different layers the same story is repeated. A parent unit with certain objectives has a structure where the child units have differentiated objectives that nevertheless contribute to the objective of the parent unit. This leads to our first hypothesis:

Hypothesis 1a

> A parent unit will differentiate its child units, where the child units have different objectives that nevertheless contribute to the parent unit's objectives.

We have also seen that due to their differing objectives units can employ different strategies and structures to their sibling units. This has been seen twice, firstly the differing structures employed by the research and development units, and again within development where some functions have structured their sites to service all TA's and others to specialise on certain diseases.

Hypothesis 1b

> To achieve their objectives, units will employ different strategies and structures from their sibling units[62].

In line with Lawrence & Lorsch, it was found that as uncertainty increases, or more particularly project fluidity, achieving both differentiation and integration of child units becomes more difficult. This is most clearly seen when comparing the research and development units. Development has succeeded in achieving differentiation by both disease and discipline and at the same time integrating the child units via it's project structure. Research on the other hand has differentiated its child units by disease, while differentiation by discipline is achieved within the child units (RA's in this case), meaning integration between disciplines is only achieved within the child units and not between, or put another way integration is achieved lower down in the company.

62 An alternate hypothesis is that the strategy of child units is bound by the strategy of the parent unit.

Hypothesis 1c

> High levels of project solidity (fluidity) increase (reduce) the extent of integration at higher levels in the organisational hierarchy.

These hypotheses carry implications for Eccles' framework. In particular Eccles framework operates at the company level, suggesting that a company follows a singular strategy, with a single structure, and operates a uniform set of controls[63]. This directly contradicts both the above hypotheses, and the findings of van der Meer-Kooistra (1994) and Colbert & Spicer (1995) who found variety in the ways transactions were conducted by units within the same companies. Hypotheses 1a, 1b, & 1c are broadly consistent with van der Meer-Kooistra's hypothesis 8, which explicitly states that internal transactions can be coordinated in different ways. Hypotheses 1a, 1b, & 1c are also broadly consistent with Emmanuel & Mehafdi's (1997) concerns over measuring transfer prices at the company level.

> "Surveys which ask respondents about the primary, dominant, most common / frequent or most significant transfer pricing method are difficult to compare. Ambiguity is apparent when responses indicate more than one method is used but fail to relate these to any specific inter-unit trade."

8.3.1 Transaction Cost Economics in the Strategy & Structure Story

In the previous three chapters we spent some time discussing the levels of asset specificity involved in activities of the three units, which are summarised in table 8.1. In particular, human asset specificity was explored extensively. The

63 Strangely Eccles also produced a decision diagram to help determine the correct transfer pricing system for individual transactions, thus Eccles appears to have believed his framework is operational at the transaction level.

networks and sites that we found in the development unit, suggest that the human asset specificity exists in those networks and teams. The value of an individual is likely to be low in most cases, but the cumulative knowledge specific to the operations of the various teams (especially the project teams in development) held by the members is the source of the value that is unlikely to be replicated easily by competitors. Furthermore, the close proximity that exists within the operations of these teams creates a link between the concepts of human asset specificity and site asset specificity. The importance of team structures to the concept of human asset specificity also creates a link with the structure of the company, in particular the integrating mechanisms of the units. It is within the development unit we see the most elaborate team structures and therefore this is the part of the company that is likely to have the highest levels of human asset specificity.

Table 8.1: Asset Specificity

	Research	**Development**	**Production**
Types of Asset Specificity			
Human			Moderate
Disease Area	High	Moderate	
Technical Discipline	Moderate	High	
Physical	Low	Low	Moderate
Dedicated	Moderate	Very High	Low
Temporal	High	High	Moderate
Brand/Corporate Awareness	High	Very High	Moderate
Uncertainty	Very High	High	Moderate

Of the remaining four variants on asset specificity, physical assets appear not to play a significant role in the research and development units. Even within the production sites, the assets were generally seen as being usable in the chemical industry as a whole, although contamination and compliance issues reduce the flexibility of those assets. Dedicated asset specificity was highest in the

development unit, particularly within the clinical operations. It is perceived that only the large pharmaceutical companies can take mainstream drugs through the FDA phases and afford the marketing campaigns involved with those drugs. The importance of marketing campaigns underlines the importance of corporate awareness for the development unit. Finally, temporal asset specificity appears to be significant in all three units, yet within those parts of the company that have a project model, namely the research and development units, in particular, the time taken to complete certain tasks is a major investment that requires protection, including monitoring. Overall the evidence[64] suggests that asset specificity is highest in the development unit, followed by the research unit, and finally production.

Beyond this, the more usual TCE explanations help establish the link between the assets and the need for integration and protection of assets. The need to protect and monitor the use of assets was demonstrated in the different units[65]. Physical assets in production have a limited flexibility in that they cannot easily be shifted from production of one drug to another in the short term, thus requiring centralised control of production flows between sites in the production unit. The sheer size of operations in development prevents those operations from being replicated by the market outside the company, again explaining the integration of those operations within the company. The corporate awareness of the company, given the extensive marketing operations of the large pharmaceuticals companies, is an asset that requires protection[66]. Finally the investments in temporal assets, especially in the research and development units, require careful monitoring and control. Project work that is outsourced requires time to complete, which constitutes an investment. Failure to disclose problems by the contractor was considered a significant problem in outsourcing project work. Although the use of contract research organisations (CRO's) is not impossible, internalisation of the work is preferred for the early more fluid

64 See sections 5.3 to 5.5, 6.4 to 6.7, and 7.4 for a fuller discussion of these variables.

65 See sections 5.4 and 6.8.

66 For example, DrugCo's 2004 annual report records "selling, general and administrative expenses" as the largest of the four categories of "operating costs" (p. 78)

pieces. This shows the importance of integration of the project management with the line management to ensure problems are detected as soon as possible.

8.3.2 Project Solidity

The solidity of projects was covered in the chapters on the research and development units[67]. This included the uncertainty over successful completion of projects, the short life spans of projects, the high attrition rates of projects, the uncertainty over the requirements of projects, and uncertainty over the aim of projects. In particular the short life span of projects was cited as the main reason by the accountant in R&D as the reason for project costs not being kept in the research unit.

Daft & MacIntosh (1978 & 1981) noted the importance of the concepts of task variety and task analysability. Task variety is defined as the "frequency of unexpected and novel events that occur in the conversion process". Low task variety is where the "participants experience considerable certainty about the occurrence of future events", and high task variety is where "participants typically cannot predict problems in advance." Task analysability is defined as the way in which participants respond to problems. Analysable tasks are those where "participants follow an objective, computational procedure to resolve problems", whereas those task that are not analysable are those where "no objective, computational procedure will tell a person how to respond ... participants may have to spend time thinking about what to do, and they may actively search for solutions beyond normal procedures."

Both task variety and task analysability are potentially linked to uncertainty over the requirements of projects. Unexpected and previously unseen (therefore non-programmable) problems are likely to lead to changes in requirements for items such as personnel, time for learning/searching, outside services, etc. Therefore there is a potential partial link between task variety & uncertainty and project

67 See the sections 5.2 & 6.10 on project solidity.

solidity. There is no obvious direct link between project attrition rates and task variety & analysability.

It is possible innovative projects in early stage research experience unexpected and previously unseen events that force large research organisations to differentiate their personnel into specialist teams who are able to develop the expertise to quickly respond, investigate, & solve problems. Because such teams are relatively self-contained, the use of timesheets for rationing the scarce resource of labour time is largely superfluous since the team leaders are able to directly monitor time usage. Accountants on the other hand see little benefit in keeping project costs because of the short life expectancies of early stage projects. Thus research managers and accountants do not see benefit in keeping project costs, although for different reasons.

The solidity of projects appears to link in strongly with the structure. In particular we see that the greater uncertainty in the research unit has placed a limit on the unit to achieve as much integration as seen in the development unit. The latter has been able to use the project team hierarchy, including the timesheeting systems, to achieve both differentiation between the different disciplines and integration at a higher level in the hierarchy. The former achieves differentiation of the different disciplines only within the separate RA's, and there appears to be little integration of the disciplines between the RA's. This is due to the higher uncertainty, especially the fluidity of projects, making the control of project work, and the use of resource by projects more difficult. This mirrors the work of Lawrence & Lorsch (1967) who found that differentiation and integration were negatively related variables, but uncertainty increased the difficulty of maintaining both simultaneously. As we will see in the next story on cost allocation, part of this difficulty can be seen in the accounting system, where attaching labour hours to projects is seen as problematic if not impossible.

Thus we have found potential links from strategy and project solidity to the

structures found in the company. Asset Specificity has been shown to be more complicated. In particular, the human asset specificity and site asset specificity have been shown to have the most obvious link to the structures within DrugCo, but with a problematic causation. We will see how the location of sourcing decisions and type of accounting systems used, in particular the cost allocation to projects and products, are linked into the structure.

8.4 Cost Allocation Story

Table 8.2: Cost Allocation to Projects and Products

	Research	Development	Production & Marketing
Capital	No	Not usually, but occasionally	Yes, ABC claimed
Labour	No	Yes, at standard rate	Yes, at standard rate
External Spend	No	Yes, actual amount	Yes

The strategy & structure story showed that each parent unit differentiated its child units to have different objectives, and then integrated those child units to achieve the parent unit's objectives. It was also shown that varying degrees of differentiation and integration were achieved, most notably the difference between the development and the research units. Furthermore we saw this pattern repeated at multiple levels, more specifically between the four different levels: company, organisation, RA & function, and site.

8.4.1 Cost as an Objective

Approximately 80% of the total costs of R&D are in development. Given the high attrition rate in development of 90%[68], it makes sense for DrugCo to ensure only the most likely candidate drugs go into development. This is indeed the

68 Henderson & Cockburn estimate only 1 in 1000 compounds investigated become candidate drugs, an attrition rate of 99.9%, significantly higher when compared with 90% for development projects to turn candidate drugs into prescription drugs.

case since the movement of a drug into the development unit is a main board decision. Paradoxically, from a cost control perspective the cost of the research projects themselves is of secondary importance. Since the total costs of the RA's are known, metrics such as cost per candidate drug are known, but reliance on such measures is dangerous since it may well encourage exactly the wrong behaviour. For instance it may encourage research managers to produce candidate drugs at the lowest cost they think they can achieve. But this is likely to increase the chances of failure later on when the drug is in the development unit, by which time significantly more costs are incurred in the more expensive FDA phases. Thus high quality candidate drugs are the greater emphasis for the research unit rather than cost efficiency. Furthermore since labour costs (and associated costs) are the main costs in research and it is not a "hire-and-fire" unit, the variability of costs would be expected to be relatively low. Again we see that cost control is a relatively unimportant objective for research.

We have already seen that the development unit constitutes 80% of the costs of R&D in total, furthermore, since a large part of that expenditure will be on purchase of external products & services, especially the costs of patients & doctors for clinical trials, the costs would be expected to be much more variable than those in the research unit. Therefore cost control would be expected to be a higher priority than in research, and indeed the staying on budget was seen as one of the important KPI's, next to being on time and within scope.

However, projects in development are not abandoned due to development cost. Instead four reasons are given for the abandonment of development projects. Firstly projects are abandoned because they don't work, that is they fail to achieve the medical aim because of unacceptable side effects. The second reason given is changes in FDA rules. Development projects can take over ten years to complete, and in that time the standards expected of prescription drugs change. Thus while a candidate drug may start with side effects that are acceptable at the beginning, they may no longer be acceptable at some point during the development process. The third reason is that another pharmaceutical

company may get a competing drug through the FDA phases first, and unless the drug still in development is significantly better, it is unlikely to get on government-approved lists. While costs still need controlling, the emphasis is on getting project milestones completed on time, as will be shown in the budgeting story. Finally it was suggested that some drugs (not many) are abandoned because production costs are too high.

In the production unit, cost is seen as the third most important key performance indicator, after compliance with regulatory bodies (quality) and stock management. Although comparison between the project based research and development units and the product based production unit is problematic, we do know that the level of uncertainty is such that the flow of intermediate products between plants is centrally controlled. Thus we can hypothesize that as uncertainty decreases, centralised control and usage of cost allocation increase.

Hypothesis 2a

> Units pursuing different objectives have differentiated accounting needs.

Hypothesis 2b

> As the relative size & variance of costs increases (decreases), the importance of cost control as an objective increases (decreases).

Hypothesis 2c

> As the location of the cost effects of the actions of a unit increasingly lie outside (inside) the boundaries of that unit, the relative importance of cost control as an objective decreases (increases).

8.4.2 Cost Allocation and Integration at Levels 1 & 2

Since DrugCo has chosen to differentiate its child units along the company's value chain, it has created a sequential form of interdependence between the three child units. However cost transfers make no contribution to integration between these three units. Costs are neither transferred from research to development, nor from development to production. We can suggest a number of factors to explain this.

The movement from research to development, that is the acceptance of a candidate drug into the development phases is a main board decision. This centralisation means that there is unlikely to be any information in any costs transferred from research to development that is relevant to decision making in the development unit. The movement from development to production is more or less a foregone conclusion. It is inconceivable that the company would successfully pass a candidate drug through the FDA phases, and then decide not to produce and sell that prescription drug given the revenue that is possible.

In the research unit, since cost control is a relatively low objective for the research unit, transferring costs from research to development would potentially create just the wrong incentive as noted before. Furthermore, since project costs are not calculated, and transfer of costs would have to be based on an average, most likely cost per drug for each RA, which would in turn decrease the meaning of any transferred cost.

In development the large lead times mean the costs of projects from development can include costs that occurred up to twelve years ago. Therefore if project costs where transferred from development to production, it is questionable that managers would perceive any meaning in those costs.

8.4.3 Cost Allocation and Integration at Levels 2, 3 & 4

Going down another layer, to integrations between levels 2 & 3, we see differences in the cost allocation systems between sibling units. Within research (see illustration 7.8), dual differentiation by both disease area and technical disciplines has not been achieved, rather differentiation of technical disciplines has only been achieved at lower levels, and integration between the technical disciplines has failed to span between RA's. Because there is little integration between RA's, including little sharing of personnel, the need for cost allocation to projects becomes less obvious. Going down yet another layer to within the RA's (levels 3 & 4), the formal techniques of the accounting system, in particular the use of timesheeting, are considered to be inappropriate for controlling the fluid projects within the RA's, in particular manager's perceived timesheeting to be too time consuming, but instead appear to use less exact methods for allocating human resources, while accountants felt that the short life spans of projects did not justify allocation.

However, as we have already noted, there is little incentive to transfer costs from research to development, which in turn is also likely to reduce the need to allocate costs to projects. Therefore we can see a potential link between the uses of cost allocation at one layer and another layer.

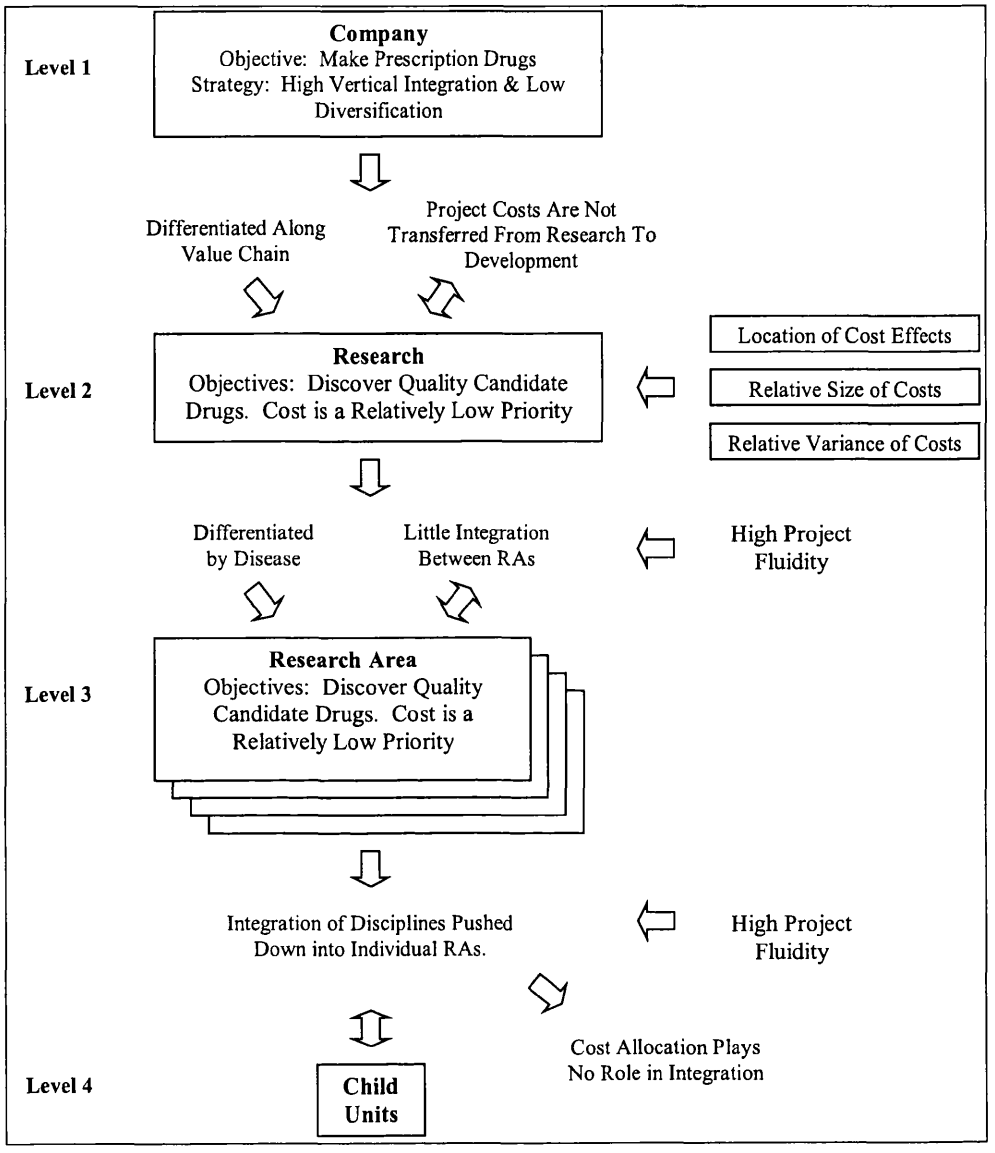

Illustration 8.8: Objectives, Strategies, Structures and Cost Allocation in Research

The development unit has achieved differentiation of the disease areas and technical disciplines at the same high level (see illustration 8.9). Integration of the functions with the disease areas is achieved by use of the project management teams. The use of cost allocation appears to play an important role in this integration mechanism. Labour costs and external spend are allocated to projects, thus the cost allocation system provides a mechanism for allocating the scarce resources of human capital and external expenditure. The actual cost attached to FTE's does not seem to be that important from the perspective of

project management, rather the rationing of the scarce resource, labour hours, is important. The significance of the cost allocation system in integrating projects is demonstrated by the way project managers appear to think of projects as consuming so much external spend and Full Time Equivalents (FTE).

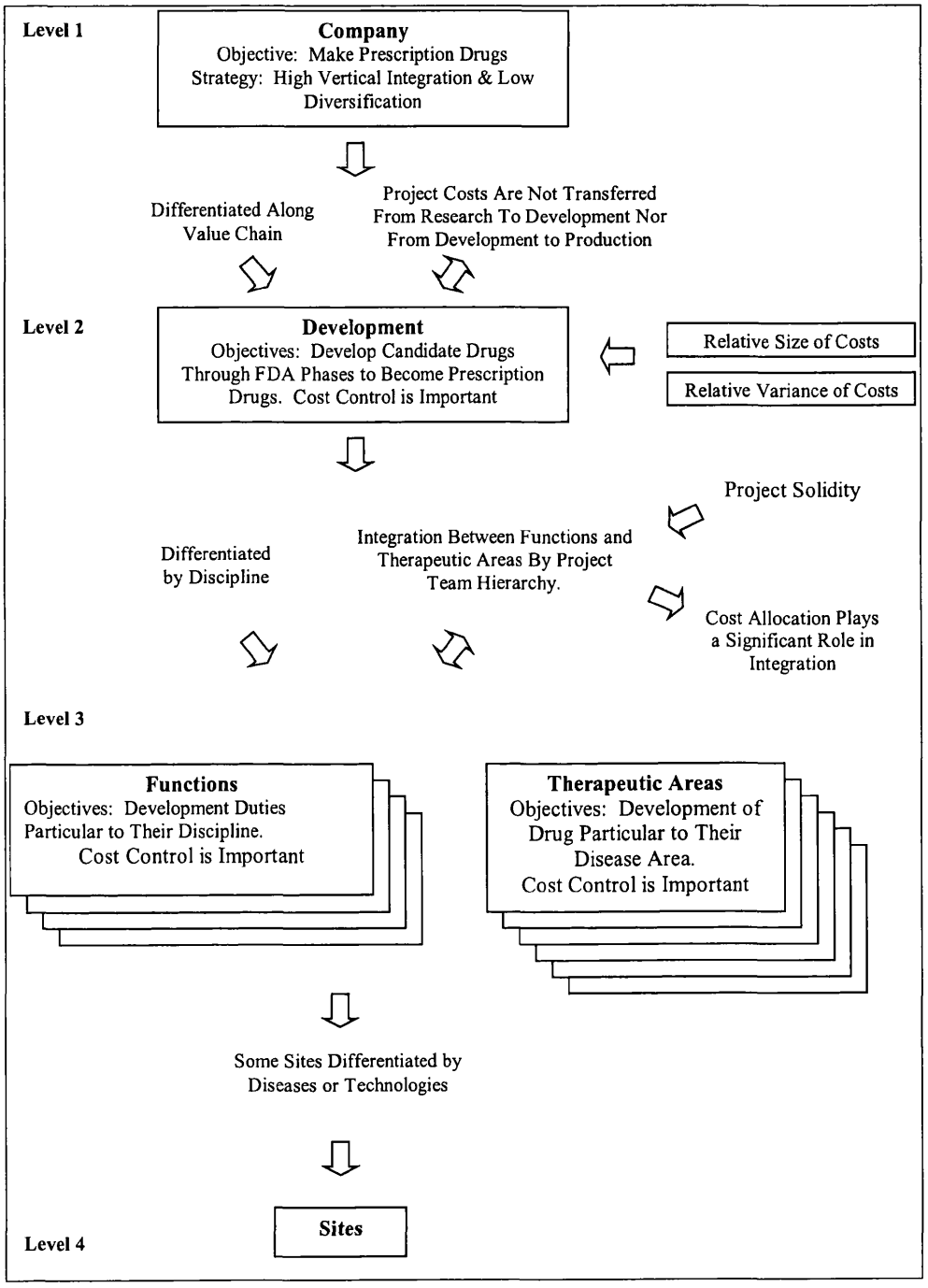

Illustration 8.9: Objectives, Strategies, Structures and Cost Allocation in Development

From the perspective of Daft & MacIntosh (1987), the integration of the functions in the development organisation may be seen as a form of reciprocal interdependence, where the different functions have to coordinate their resources and schedules for each project. Daft & MacIntosh predict that operating budgets and statistical reports will tend not to be used, but instead "norms, supervision and other forms of personal, decentralized control" are preferred. However, as we have seen, cost information is used for planning and control. It is the relative solidity of projects, coupled with improved technology for coordinating projects over separate locations and teams, that seems to explain the failure of Daft & MacIntosh to predict the importance of cost information in the development unit.

Within the production & marketing operations, we find that a more traditional accounting system is used for allocating costs along the value chain. Use of ABC is claimed and full costing is used in production performance measures. As already mentioned, costs are not transferred from development to production.

We have seen that sibling units can have different objectives, and the relative importance of cost in those objectives can vary. Furthermore as we have seen the cost allocation system used by parent units can play different roles in the integration of child units. We have seen how the accounting system is too formal a system for achieving integration in the research unit where the extent of integration itself is lower than that achieved in the development unit, while in the development unit, cost allocation contributes to the integration of the unit's activities. Since the extent of integration is linked to the fluidity of projects, it therefore follows that the use of cost allocation is also linked to the fluidity of projects.

Hypothesis 2d

> The lower (higher) integration is pushed down (pulled up) the company hierarchy the less (more) likely cost allocation is to play a role in integration.

Hypothesis 2e

> High levels of project solidity (fluidity) increase (reduce) the likelihood of cost allocation being used for project costing.

Daft & MacIntosh (1978 & 1981) found that as task analysability declines, the use of equivocal information increases, that is, management uses softer types of information. To some extent a similar message is found above, where increasing project fluidity is associated with less use of cost information. Although this raises further questions over what constitutes "soft" information, as discussed later in section 9.1.1.

8.4.4 Cost as an Objective and Cost in Integration

As noted before in chapter 4, section 4.6.1.3, there remains a problem in this story. The importance of cost control is related to the relative size & variance of costs and the location of the cost effects. In the case of DrugCo this means cost control in research is considerably less important than in development. If cost control is relatively unimportant than in development, it follows that cost allocation to projects is less important, which explains why there is cost allocation (if only partial) in development but none in research. But hypotheses 2d & 2e state that cost allocation is associated with the level of project fluidity. Thus we have two competing sets of hypotheses. Furthermore, the case data does not allow us to eliminate either. Research has more project fluidity and cost control is relatively less important compared to development. Either, or both hypotheses explain the relative "usefulness" of cost allocation to projects.

There is no way with the patterns demonstrated in DrugCo to eliminate either set of hypotheses. Ultimately, the only way to further investigate this conundrum is to collect more instances, in other words, more cases. But, as explained in section 4.6.1, that is outside the remit of this piece of research.

8.4.5 Potential Further Variation in Cost Allocation

We have seen variance in the accounting systems used along the (vertical) value chain between the different units, but we have so far found no evidence that different parts of the development unit have different systems for allocating labour or external spend to projects.

Variation between levels (along the horizontal) is less obvious. No variation in the use of cost allocation has been found between levels, but it does remain a possibility. There is potential for ambiguity over what constitutes capital expenditure and external spend, and it has been noted that capital costs are occasionally charged to projects, thus it is possible that different units within development have differing definitions of what constitutes capital expenditure and external spend, and charge greater or lesser amounts of capital to projects.

We have already covered in the structure story that the development unit has seen child units that have chosen different strategies and structures (full toolkits vs. centres of excellence). In particular the child units that have chosen to set up centres of excellence have chosen a strategy & structure that appear to differ from that of the development unit as a whole. Thus we see variation in the strategy & structure along the horizontal. This suggests that the cost allocation system may be less flexible than the strategy & structure, suggesting the potential for mismatch between strategy & structure and cost allocation systems at lower levels.

8.4.6 Ramifications for Previous Frameworks

DrugCo's cost allocation systems, or rather lack of cost allocations at certain parts, has ramifications for both Eccles' & Spicer's frameworks. Eccles MAP includes one segment where accounting controls are not used on the vertical chain, namely the collective unit (bottom left quadrant), but this is where both vertical integration and diversification are low, yet in DrugCo the RA's are certainly integrated with the development unit. For instance, candidate drugs discovered by the RA's are not as a rule sold to anyone else. Personnel in research are known to continue working on projects after they have moved into the development stage, the costs of those personnel are allocated to development projects, and development management have noted the importance of interfacing with research personnel for ensuring that candidate drugs are passed into the development stage efficiently and effectively. Thus the RA's are certainly part of the vertical chain, and the links in the chain from research to development are not insubstantial, yet no project costs are calculated in research, neither labour costs nor project expenditures are allocated to research projects, and no research project costs are passed onto development. Therefore, Eccles' MAP does not appear to fully explain the strategies and accounting systems used at levels lower than the single company level.

Spicer's framework, based on the Transaction Cost Economics (TCE) school of thought, relates the control of transfers and the allocation/transfer of costs & profit to the levels of asset specificity and the levels of uncertainty. Certainly it was found that asset specificity and uncertainty are higher in the development unit compared to the production unit, and there is a corresponding change in the way costs are allocated to projects, namely that capital costs are generally not allocated, external expenditure is allocated at actual rather than standard costs, and little emphasis is placed on the standard costs of labour used. However Spicer's framework does not include any notion of cost allocation or transfer prices not being used. While cost controls are almost always used within DrugCo, their particular use for controlling individual projects was found not to

be universal throughout the company. Capital costs are not allocated to projects in the development unit, and no costs are allocated in research (consequently costs are not passed onto development), therefore Spicer's framework has been found wanting. Within DrugCo we find that as the levels of uncertainty increase, in particular as the fluidity of projects increases, the use of cost allocation for controlling the use of resources becomes less since the level of integration that is achievable declines (see hypothesis 2e). It is possible that the importance of uncertainty has been underestimated in previous TCE research. The marketing literature[69] that has utilised TCE, has come to recognise that despite the successes they have had in utilising TCE to explain the sourcing of marketing personnel in companies, uncertainty appears to play more than just a subsidiary role to asset specificity. The works of van der Meer-Kooistra (1994) and Speklé (2001) have both turned to uncertainty to explain the differences in accounting systems beyond TCE's explanation of the choice between market, hybrid, & bureaucratic control. Van der Meer-Kooistra used information asymmetry to explain decentralised decision-making, while Speklé used "information impactedness"[70]. Unfortunately Speklé's framework does not seem to match with either the research or development units. Speklé predicts that where there is high "information impactedness", control is achieved by setting boundaries to behaviour and implementing severe punishment for breaches, yet in research, cost is a relatively minor factor in performance, and punishments for going over budget are not reported to be severe.

8.5 Performance Measurement

The use of different key performance indicators (KPI) in DrugCo is a source of interest in this study. We saw the quite varied importance of cost as a KPI throughout the company. In the production unit cost was perceived by the accountants to be one of the most important KPI's in reports, although not the

69 See Rindfleisch & Heide (1997) for a review of the marketing literature.

70 "Information impectedness" as defined by Speklé expands on information asymmetry, to include situations where both of the transaction parties have identical information, but it would be costly for an arbitrator to gain that information.

most important. Compliance issues held that position, while stock management was of great importance as well. In the development unit, cost was one of the important measures of project performance[71], along with time and scope. Within research however, while the budget was seen as important, the importance of cost in performance measurement was seen as low relative to the other KPI's. As we have already noted in the research chapter[72], the absolute importance of cost remains high throughout the unit, but the relative importance to other KPI's changes.

Hypothesis 3a

> At the unit level, cost based KPI's remain important in an absolute sense in evaluating the overall value chain.

The absolute importance of cost in performance measurement mirrors the findings of Widener (2004), who found that strategy, human asset specificity and uncertainty, although they were associated with greater use of non-traditional forms of performance measurement, they were not associated with less use of traditional performance measures. That is, a strategy of investing in specific human capital, having significant human specific assets, and greater uncertainty, was not associated with less use of traditional performance measures. However the questions underlining Widener's research treated the two different types of performance measures as two separate concepts, and failed to recognise they are two concepts that are to some extent measured relatively to each other. Instead the importance of KPI's, whether traditional or non-traditional, should be ranked against each other. More recently consulting firms have shown concern over the large number of KPI's that can appear on management performance reports, and have suggested these need to be reduced. To some extent this concern is justified. Accountants in DrugCo admitted that some reports where too long.

71 This is consistent with the measurement of labour and external spend for projects.

72 See section 5.7.

"Management would feel at the moment probably too many (KPI's are used), I would accept that. There is a push to eliminate."

(R&D Accountant)

However, some of this concern is not justified. Interviews with both accountants and managers suggested they viewed KPI's as being ranked. Exactly who determines the ranking is unknown, but one could hypothesise that management as well as the accountants have a role to play in determining the rankings. If this is the case then the ranking of management may also be filtering the KPI's to determine which should be given greater place and which should be ignored. Furthermore the ranking & filtering may be an on going process, with changes in rankings each period. This dynamic nature was most clearly shown in the research unit, where cost was not perceived to be an important KPI, unless management had a record of cost problems. This appears to be consistent with Gerdin's (2005) more general results that showed in cases of low interdependence where only low levels of management accounting system (MAS) information would be expected, performance did not decline when there was large amount of information, suggesting information overload was not a problem.

In the previous section on the cost allocation story we already touched upon the differences in the relative importance of cost KPI's between the company's three child units. In research cost was not seen as a KPI that would be at the top of the list, except if there was a history of over spend. In development staying on budget was seen as important, although the importance of cost in decision making was lower. Finally in production cost was ranked as the third KPI.

However the caveat noted above still applies, especially to researchers. The importance of cost measures should be seen relative to the other key performance indicators (KPI). Questions that ask respondents to quantify the

importance of meeting budgets or other cost controls without reference to other KPI's, are likely to return high values. It is unlikely that this is the answer expected or desired by many management accounting researchers. Cost is almost always one of the KPI's, but its importance relative to other KPI's differs. In DrugCo the relative importance of cost in the performance measurement & evaluation system, varies between the units, from unimportant (unless there is a history of over spending) in the research unit, to third position in the production unit.

8.6 Sourcing Story

As with the strategy, structure, and accounting systems, the location of sourcing decisions tend to differ between the units. As we learned in the research chapter[73], sourcing decisions within the research unit tend to be highly decentralised. Sourcing decisions within the development unit also tend to be decentralised to the project teams (although centralised sourcing & procurement personnel are present on the teams), whereas supply chain teams centrally control sourcing decisions within production.

8.6.1 Source Search

Before we explore directly the causes of this difference, it is important to note a distinction. The locations of sourcing decisions are not necessarily the same as the locations of the source search. In particular, within the development unit it was found that there was a sourcing & procurement unit that searched for what were referred to as "strategic suppliers", companies with which DrugCo develops long-term relationships. However "tactical suppliers", suppliers without such long term relationships and located by project team members are also used.

73 See section 5.6.

Hypothesis 4a

> The location of outsource search is not necessarily associated with the location of sourcing decisions.

Early stage projects such as those at research and early development require small amounts of materials or short pieces of research on short notice. Therefore sourcing decisions are likely to consider locally found suppliers. In the later stages of development, large amounts drugs are required for scaling up drugs and testing, and therefore large quantities are materials are needed. Strategic suppliers, who have been located and vetted, and with whom low prices have been arranged by the centralised sourcing & procurement function, are likely to be the preferred choice. Therefore we can hypothesize that the location of source search appears to be associated with the size and frequency of the requirements, and by inference the stage in the value chain.

Hypothesis 4b

> The larger the size and frequency of the requirements, and the further along the project value chain, the more likely the sourcing search will be conducted centrally.

8.6.2 Sourcing Decisions

We have already learnt that project costs are not kept in the research unit, strongly suggesting that financial measures do not play a role in rationing resources to individual projects in a direct manner. Financial measures are used to some extent to control project spend at a more aggregate level, such as the total spend of an individual Research Area (RA). Senior management in the research unit, in our case the head of one of the RA's, admitted to not making sourcing decisions due to insufficient knowledge. This suggests that sourcing decisions are delegated to project teams or lower, and use of internal resource is

not mandated. Therefore as with van der Meer-Kooistra, information asymmetry appears to explain the need to decentralise sourcing decisions within the research unit to those with the necessary information to make those decisions. Since the cost of using internal resources is not charged directly to research projects, the use of internal resources would appear to be protected. Nevertheless the question remains how are the limited resources, mostly the hours available from the limited number of employees, the human assets, rationed. Outside suppliers are used when there is a capacity issue. Furthermore, there were hints that non-accounting records are kept that indicated what projects personnel were working on.

> "What I can say is that our biggest cost is people, we have measures of number of people involved in projects."
>
> (Research Manager)

A not dissimilar story is found in the development unit. Sourcing decisions are delegated to project teams and not mandated. Protection of internal resources is achieved in a number of ways. Firstly members of the function skill types supplying the labour are represented on the project team. Secondly it was claimed that line management rather than project management were held responsible for delivering projects. Lastly multiplicative bonuses were used in the development unit, although the bonuses appeared to be relatively small.

> "In terms of bonuses, your bonus has three factors, one is your individual performance, how you as an individual have done in your own targets, there will also be a factor how you and your area, in this case R&D, perform, and thirdly how DrugCo has performed, and you multiply the three, so you may have done a superb job, if the company has had a shit year you may end up with nothing."
>
> (R&D Accountant)

This does raise the question of how the company prevents excessive internalisation of capabilities. Only in the production unit is the traditional way to secure transfers observed, that is centralised control of the transfers by supply chain teams who coordinate the flow of items between sites, and by extension, control sourcing decisions. Thus, we see a range of control mechanisms to ensure that transfers involve a significant amount of company specific investments. Mandating the transfer is just one solution. All previous frameworks, Eccles' (1985), Spicer's (1989), and van der Meer-Kooistra[74] (1994), assume that mandated transfers are the only way to secure transfers along a value chain thus ensuring that the internal demands for internal supplies are guaranteed. However, as seen above, a number of different mechanisms are used to secure transfers and ensure internal resources are used.

74 Van der Meer-Kooistra does hypothesize that parts of the contractual process are decentralised when there is information asymmetry.

Hypothesis 4c

> Freedom to make sourcing decisions varies amongst different units.

So far it has been seen that information asymmetry plays a role in explaining the decentralisation of sourcing decisions.

Hypothesis 4d

> As information asymmetry increases (decreases) the location of sourcing decisions becomes more decentralised (centralised).

Nevertheless, given that in the development unit the sourcing decisions are made by the project teams, and that the accounting system, in particular the budgeting of labour (FTE's) and external spend to individual projects, plays an important role in allocating resources, one suspects that the location of sourcing decisions is tied in with the integration systems, including the accounting systems. Since we have seen project solidity play an important role in determining the level of integration achieved, it would appear that project solidity plays a role in the location of sourcing decisions. For instance uncertainty over the requirements of a project makes it likely that there will be changes in the requirements at a future date. This is especially true for early stage research & development; therefore it is unlikely that senior management is in a position to have the necessary knowledge or the speed to react to those changes, and costs are likely to be relatively low given the small size of the requirements.

Hypothesis 4e

> The location of sourcing decisions is associated with the integration mechanisms within a unit.

Hypothesis 4f

> As project solidity increases (decreases) the location of sourcing decisions becomes more centralised (decentralised).

8.7 Negative Case Analysis

An alternative explanation for the research not using transfer prices has become apparent in this study. One of the reasons timesheeting is not undertaken in the research unit is that the head of the research unit does not want his personnel filling in timesheets. It is felt that this is a distraction from the scientists' main objective to discover quality candidate drugs. Thus we see that political and cultural factors having some influence over the accounting systems. The chief accountant of research & development also noted that the functional aspects of the accounting system were not divorced from the political factors. He felt that the head of research was not entirely averse to timesheeting, but did require a robust justification before any implementation.

> "(That's) why I don't believe there's ... time recording in Discovery (research), partly because the head of Discovery is vehemently against it, he does not see the benefits in it at all, because he can't see what is going change in the company, the manager should know what his people are doing, so why is he filling out timesheets for somebody else to look at. But you know, we've edged in, we've got the project'y bit of Discovery doing it, and what we're doing is saying, lets have a look at that and see if that gives you ... and then, you know, so you can work your way in. The infrastructure is there to collect data. The question is how far do you penetrate in, you know. He's given us a reasonable challenge which is, "convince me why it's going to make a difference. So I'm not totally against it, but just before

you make everyone do it, just let me know what we can use it for." I think that's a good challenge, and I think that's healthy"

(R&D Accountant)

The cultural and political dimensions were not the focus of this study; consequently it is inappropriate for the purposes of this study to include these concepts in the main findings given the use of previous studies to inform the questioning and analysis. Nevertheless it seems appropriate to note the importance of researchers giving serious consideration to their inclusion in any future investigation.

8.8 Conclusion

In this chapter the material and findings of the previous three chapters have been consolidated into a set of hypotheses. In the next chapter, this set is presented as an enriched framework that builds upon the previous frameworks of Eccles, Spicer, and van der Meer-Kooistra. In particular the short comings of the previous three frameworks when applied to DrugCo are discussed. In addition, the limitations of this study are outlined. Finally, in light of this study's findings, avenues for future research are discussed.

Chapter 9 An Enriched Framework

In the previous chapter four stories were outlined, all influenced by the frameworks of Eccles (1985), Spicer (1988), and van der Meer-Kooistra (1994). The exploratory nature of this research has put the emphasis on developing new theories of the use of transfer pricing and cost allocation in modern companies. To this end the frameworks have not been tested, but by investigating their match or mismatch to this case, a more enriched framework has been presented with a number of hypotheses. In this chapter all the hypotheses are combined into an overall framework, which in turn is linked to current theories, both those within the transfer pricing literature, and to the theories in the wider literature. In particular the taxonomy of Miles & Snow (1978) will be explored and linked with the framework.

9.1 Strategy

At the centre of this enriched framework is a hierarchical, layered view of strategy, uncertainty, structure, integration, control, and accounting information use (namely cost allocation to projects and products). In particular we see organisational units adopting strategies, which along with the uncertainties faced by the units, impact upon the structures adopted and their corresponding integration mechanisms, of which the cost allocation systems can play a part. The enriched framework hypothesises that uncertainty, in particular project fluidity, places limits on the integration that can be achieved (hypothesis 1c), and by extension, the role cost allocation plays in integration (hypotheses 2d & 2e). This emphasis on strategy and uncertainty is similar to the taxonomy of Miles & Snow[75].

75 Gould, Campball & Alexander (1994). refer to parent and child organisations. Despite the use of similar terminology, it has been hard to find some common ground between Gould et al. and the enriched framework presented here. The emphasis of their research has been on understanding the advantages an acquiring organisation can bring to an acquired organisation. Little is mentioned on the structural changes that may be needed. Furthermore, the multiple layers to be found in organisations are not covered. Finally, Gould et al. are at times unclear

The taxonomy of Miles & Snow places organisations along a product/market development continuum[76]. At one end of the spectrum is the defender[77] organisation that seeks to place itself in a niche market, in which it can attain and maintain some optimum of efficiency and quality. At the other end of the spectrum is the prospector[78] organisation that continually seeks new products and

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as to the correct objects for comparison. For instance, in chapter five they compare child unit management with parent unit management, what they call the "10 percent versus 100 percent paradox" (p. 79). However, this is a questionable comparison Rather the comparison is surely between the parent management and the capital markets. At times Gould et al. do indeed switch to making this comparison, such as comparing the capital investment decisions of parent companies with investment funds available in the capital markets (pp. 118-225), and thus it appears there is a lack of clarity in their research.

76 The taxonomy of Miles & Snow (1978) outlines three different but interrelated problems that organisations try to solve. The entrepreneurial problem, the engineering problem, and the administrative problem. In essence these are the strategy the organisation chooses to follow as a result of the environmental uncertainty it faces, the technology to be implemented to achieve the strategy objectives, and the administrative system implemented to control the organisation, including the structure, the locus of decision making, the communication systems, and the performance measurement, evaluation and reward systems employed.

77 The defender seeks to position itself in a niche market or domain, which it can maintain by concentrating on achieving and maintaining an optimum combination of efficiency and quality. The technological solution is to concentrate on developing a specialised set of processes that allow it to achieve its entrepreneurial objective. This in turn places the core production management personnel at the heart of the organisation, centrally controlling a functionally structured vertically integrated chain. This also means that much of the capital is likely to be tangible, with human capital concentrated in a few individuals. The accounting functions are likely to be based on financial performance with previous years used as the benchmark.

78 This results in the organisation changing products and markets on a frequent basis, which results in a need for employing flexible technology. Considerably more of the organisation's capital is in people than in physical capital, and this human capital is distributed among a larger number of individuals. The downside of employing flexible technology is the near impossibility of maintaining efficiency. The rapidly changing product line, further complicated by a diverse range of markets, means that central control is virtually impossible, therefore the organisation employs the divisional structure that made Du Pont famous in the

markets. In between these two extremes lies the analyser[79].

The different organisational types are the result of different interactions with environmental uncertainties. Both the defender and prospector manage environmental uncertainty by trying to impact upon their environment, respectively by insulating themselves in a niche market which it dominates, and by creating new markets. This leaves the causality of the relationship between strategy and uncertainty unclear:

> "Nevertheless, it is clear, as Child, Weick, Argyris, and others have argued, that managers enjoy substantial freedom to create, shape, and manage the environment in which the organizations exist."[80]

This corresponds with the enriched framework, which leaves the exogenous and endogenous qualities of uncertainty ambiguous. Applying Miles & Snow's taxonomy to DrugCo as a parent, suggests it is a prospector organisation given the necessity for the organisation to continually research and develop new prescription drugs[81].

1920's & 30's. Information systems are likely to be horizontal, disputes settled by integrators/arbitrators, and rewards based on comparisons with competitors. Far greater use of comparisons with competitors is to be expected, with little use for historical data.

79 The analyser lies somewhere on the product/market development continuum, between the defender and prospector. This organisational type follows the prospectors into promising products & markets, yet maintains a presence in mature markets. Technologically it will employ both dedicated and flexible assets. In trying to achieve this optimum, it often implements a matrix structure, along with complex control systems that include both hierarchically and horizontal information systems.

80 Miles & Snow, 1978, p. 6.

81 At first glance, the low diversification of DrugCo relative to other pharmaceutical companies suggests that it is less of a prospector than other pharmaceutical companies. However, it may be that the prescription drug market has high growth and is more uncertain than consumer drugs, which would place DrugCo further towards the extreme end of the product/market development continuum. This is a question that is left to future investigators to consider.

9.1.1 Heterogeneity

Whatever the strategy and structure chosen by the organisation as a whole, the child units are unlikely to face an identical mix of exogenous and endogenous uncertainty, and may therefore follow dissimilar strategies. This leads to different structures being adopted internally by the child units. This is captured by hypotheses 1a & 1b. The work of Lawrence & Lorsch (1967) suggests that structural differentiation does exist in some industries and individual companies.

Child units with higher levels of project solidity, that is, where projects have more certain aims and requirements, where the lifespans are long, and the attrition rates are low, are more likely to be integrated at higher levels, and more likely to allocate costs to projects, as is seen in the development unit. Higher levels of project fluidity are more likely to lead to integration at lower levels, and less or no cost allocation to projects, as seen in the research unit. Cost accounting has use in helping to integrate projects within the development unit, whereas it is perceived to have little utility regards integration of projects in the research unit. Cost accounting also has a minor role is to play as projects move from research to development[82]. Finally, production and sales use full cost allocations to products. The relationships between project solidity, integration, and cost allocation are summarised by hypothesis 1c and hypotheses 2d & 2e.

Consistent with this framework and the embedded nature of this piece of research, there appears merit in applying Miles & Snow's taxonomy to the child units of DrugCo. In the case of DrugCo, the research unit places less emphasis on integration than the development unit due to the high levels of project fluidity.

Miles & Snow's taxonomy offers the insight that the research unit, more clearly than the organisation as a whole, appears to typify the prospector organisation.

82 The reader should remember that cost accounting is used to some extent when research projects are moved into development when research personnel that participate in development projects fill in time sheets.

Tasked with finding new candidate drugs, it has adopted the predicted structural solution to the administrative problem, namely separate Research Areas geared towards particular products & markets, albeit as cost centres rather than profit centres. Meanwhile the development organisation resembles an analyser. It has placed greater emphasis on efficiency, adopted a matrix structure, complex information and control systems. These include project teams, coaching roles, and the management hierarchies within the functions. The project budgeting system plays a partial role in controlling the use of resources used by projects. Thus we see that the enriched framework and taxonomy complement each other.

The finding that in the uncertain environment of the research unit, accounting data are not used for managing projects, appears similar to the findings of Daft & MacIntosh (1981), who found greater use of soft data in uncertain environments (more particularly where task analysability is low).

This still leaves an important question, how far down the the organisational hierarchy does this pattern continue, and consequently how much does the use of cost allocation (and accounting systems in general) vary between child units at different levels? Project managers in development are aware that some capital costs are allocated to project costs. One suspects this may be partly due to an ambiguity between external expenditure on specific projects and capital expenditure on specific projects. Therefore the granularity of the differentiation remains unknown, and it is unclear if the granularity of structure and the accounting information system are related.

We also still don't know whether this differentiation exists in other companies, or extends to the types of centre used, the transfer prices used, or the type of protection used for internal transfers in other companies. However, given the company's context of knowledge intensive projects and long value chains, we can make the analytical generalization that the hypotheses generated here are most likely to be evident in companies with similar projects.

There appears to be some merit in differentiating organisational units by centre type. Eccles' framework used the notion of different types of centre[83]. Both accountants and managers in DrugCo understood the concepts of cost and profit centres[84], thus using the type of centre as the dependent variable seems possible[85]. However, the simple differentiation between cost and profit centre has been demonstrated to be insufficient; all the units analysed in this research are cost centres, yet clearly there are different variations to that concept, including ones where cost accounting does not play a significant role in controlling individual projects. Spekle's "archetypes" present a richer set of centre types, however the dimensions of the centre types or archetypes still need exploration[86].

9.1.2 The Dimensions of Strategy: Miles & Snow versus Eccles

As noted before, the taxonomy of Miles & Snow places organisations along a single product/market development continuum, whereas Eccles sees strategy as consisting of two orthogonal dimensions, vertical integration and diversification. How can these two perspectives be reconciled? The most obvious connection between the two frameworks, is the diversification of products and services covered by an organisation. Shortell & Zajac (1990) in a study of hospitals in the US found that the number of diversified services (adjusted for number of beds) was greatest for prospectors, followed by analysers, and finally defenders. In addition, the strategy correlated with the number of diversified services added in the most recent two years, the number of planned diversified services, and the

83 Eccles used the concepts of the cost, profit, and pseudo-profit centre.

84 The concept of the "centre" appears to be seen as an internal control device, and thus provides a useful tool to help separate out the taxation and internal control issues of transfer pricing.

85 Centre type is a categorical variable and therefore if used as a dependent variable in statistical analysis, and especially in SEM, somewhat unusual statistical techniques are required.

86 Spekle's archetypes, while discussed in some detail, have yet to be placed in a framework where the properties of each archetype are comparable to those properties in the other archetypes, and therefore it would be difficult to easily distinguish among the different archetypes in the real world.

number of high technology services offered. Therefore there is a partial relationship between Eccles and Miles & Snow, in that the single product/market development dimension is partially related to diversification. That is, as one move from defenders towards prospectors, one is predicted to see greater diversification in products & markets serviced. However, as is apparent from Shortell & Zajac's research, the life and growth[87] of the products & markets is also a consideration.

While Eccles' notion of vertical integration and diversification as orthogonal concepts is appealing, there are two problems. Firstly, the work of Levy (1985) shows that although they are different concepts, they are negatively related rather than being purely orthogonal. One possibility is that uncertainty creates a feasibility boundary between the amount of diversification & innovation that is achievable and the amount of integration that can be achievable. Secondly, Eccles' predicts that costs will not be allocated and transferred when the firm has low diversification and low vertical integration, the "collective" firm, but will be transferred when diversification is low and vertical integration is high, the "cooperative" firm. This is true for production, where full costing to products is used, yet research and development are certainly integrated and highly depend on one another, yet costs are not transferred from research to development[88].

Furthermore, Eccles' framework operates at the corporate level and searches for single strategy. As noted already, viewed from this perspective DrugCo is a prospector, yet we have seen that the development unit follows a different strategy, one more akin to an analyser. Ultimately it seems more likely that strategy consists of a number of interrelated variables, namely innovation, diversification, integration, and capital orientation, along with a close, possibly bidirectional connection with uncertainty.

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87 Young high growth markets with project based products would at face value appear to be based on fluid projects, thus Shortell & Zajac's analysis is consistent with the enriched framework presented here.

88 Except for the allocation of the costs research personnel who are working on projects that have entered the development pipeline.

9.1.3 Uncertainty: Project Fluidity & Solidity

Uncertainty has been seen as an important explanatory variable since Thompson (1967). However, uncertainty has also proven to be a multifaceted beast. The classic division made is between environmental uncertainty and task uncertainty. Daft & MacIntosh further decompose task uncertainty into task variety and task analysability.

The TCE literature further complicates the picture. Firstly by distinguishing between risky and uncertain events. Risky events, although they cannot be predicted with certainty, do have known results if they do occur and can have probabilities attached. Uncertain events cannot be weighted by a probability or have unknown results. Secondly, the TCE literature sees complexity as an equally important variable in explaining the need to internalise operations.

In this study, a third content has been uncovered, namely project fluidity (or solidity as viewed from the converse perspective), which is defined as having four properties. The uncertainty regards the aims of the project, the uncertainty over the requirement needed, the expected lifespan of the project, and finally the attrition rate of projects. The advantage of this concept is that it is grounded in the case data, and it appears to cover ground not covered by the other concepts. At face value, only the uncertainty over the requirements of projects seems to have a relationship with task variety, that is, an unexpected change in the requirements of a project would seem to be an instance of a unexpected problem arising in the fulfilment in a task. However, further comparisons are undoubtedly needed among the types of uncertainty covered by the management literature, transaction cost economics literature, and in this study. To the knowledge of this researcher, no comprehensive attempt has been made to place these different variables in a single framework, and as such offers a good opportunity for future researchers to compare and combine the economic and managerial/strategic concepts of uncertainty.

9.1.4 Spicer and Transaction Cost Economics

Spicer's framework creates a spectrum of transaction types. At one end there is the fully autonomous arms length transaction, where no specific assets are involved, such as found in open markets and conglomerates. In the latter there will no mandated transfers and full autonomy given to units to negotiate any contractual details with other units, including prices. At the other end there are organisations with high levels of asset specificity and uncertainty, where transfers are mandated at actual full cost.

There are a number of problems with this framework. Firstly, it does not cover the full spectrum of treatments, namely the framework does not include provision for situations where transfer prices do not exist. More importantly, the association between asset specificity and the locations of the sourcing decisions and transfer prices & cost allocations in this study do not follow the pattern predicted by Spicer (1989) and Colbert & Spicer (1995). The levels of asset specificity do not appear to be greater in the research unit than the development unit, indeed they may be greater in the latter given the wide reaching project management teams (specific human capital) and large costs of clinical trials (dedicated asset specificity). Yet the use of cost allocation is relatively greater in the development unit rather than the research unit. Thus the development unit has greater asset specificity than research, yet uses cost allocation for projects, directly converse to Spicer's framework.

A likely explanation is that specificity of capital and uncertainty are not related to organisations in the manner implicitly assumed by Spicer. Rather, asset specificity and uncertainty although both contribute to the need for internalisation, have different impacts upon organisational strategy, structure, and cost allocation. In particular, broadly speaking, as asset specificity and uncertainty increase, Spicer predicts there will be a greater need for protection and integration. Uncertainty, as demonstrated by Lawrence & Lorsch, reduces

opportunities for formal integration mechanisms, including cost allocation as a control system. Drawing upon the grounded concepts of project solidity and fluidity, we can see the projects in research are fluid and the human capital is organised in a fluid manner, such that personnel can be moved to the necessary projects more easily than in development. In development a more solid organisation for the management of human capital, and where the accounting system does play a partial role in helping to manage the human capital, namely the timesheeting system.

Some progress has been made on measuring asset specificity, especially human and temporal asset specificity. In exploring human asset specificity, the flexibility of personnel & teams, the learning undertaken to join teams and during projects, duplicability of skills & teams, and the existence of alternative outside sources, proved useful. There does seem to be a need to extend current theories of human asset specificity to include the types of team management systems found in the development unit, which combine management from different locations and expertise. The systems allow skill types to share scientific knowledge, and also the cross-fertilisation of ideas learnt on projects to another. Furthermore these systems constitute a direct link between the concepts of integration and human asset specificity. Spekle's archetypes, noted in section 8.1.1, also seem to be headed in this direction of enquiry. Overall the links between the organisational structures within companies, uncertainty (especially project fluidity), asset specificity, and accounting use, seems to be a rich area to study.

The causality of asset specificity is also of interest. The general hypothesis of the transaction cost economic school is that where there is high asset specificity, there is a need for non-market forms of control over the integration. However, the complex non-market integrating mechanisms found in the development organisation, in particular the project team structures, include rich forms of human interaction that constitute valuable resources that are difficult to replicate. Therefore it is hard to conclude that human asset specificity is causing the

integration and control mechanism, rather they are part of the same thing, namely the team structures. Therefore, we have seen that both human capital and the accounting information systems are (at least partly) endogenous to strategy and uncertainty.

The TCE literature defines temporal asset specificity as situations where "just-in-time" systems have been set-up. However, in this study temporal asset specificity was found to exist when lengthy project work is outsourced, and DrugCo is unable to monitor the successful progress of the work. The time invested by DrugCo in waiting for the completed work represents a substantial investment. This represents a different form of temporal asset specificity than found in the TCE literature.

However, the notion that time itself is the investment leads to further questions since a number of complications are evident. Most obviously is the connection with the need to monitor projects, whether internal or external. Temporal asset specificity may be particularly sensitive to monitoring issues, for instance even if a project is contracted out to an external party over a long time, if certain milestones are easy to monitor, then the time invested may not necessarily be difficult to protect.

Transaction cost economics is a coarse theory, which while successful in explaining the use of market versus bureaucratic forms of control, and more recently hybrid control mechanisms, is less suited to explaining finer details in control mechanisms within a bureaucratic control system, such as the use of cost allocation to projects & products, or where something other than bureaucratic control is used inside a hierarchy. This study has outlined the close relationship between capital, structure, and the accounting information system. Therefore, it would seem that if the transaction cost economics theory is to be extended further into the management accounting literature, it needs linked to the finer grained strategies, structures, and accounting systems, which include those found in this study.

Daft & MacIntosh (1987), and later Gerdin (2005), measured interdependence from a different contingency style perspective of pooled, sequential, and reciprocal workflows, whereas TCE sees interdependence stemming from a combination of asset specificity, uncertainty, & frequency. At face value, the workflows of the projects in research and development would appear to be pooled, in that each project calls upon the existing functions and skill types, who provide services to the projects. However, as seen in the development unit, the complicated planning and scheduling conducted to synchronise the work of the projects suggests that the workflow should be seen as partly sequential, and even reciprocal. Indeed the partial use of accounting information in the development would suggest, as per Daft & MacIntosh, that the workflows are or sufficient complexity to limit the utility of accounting information. There is an opportunity to investigate the relationship between the TCE version of interdependence and the contingent version. This may represent a chance to unify, or at least move together, these two different perspectives.

9.2 Limitations

This study has four main limitations. The first, as already noted in section 8.2.4, there is no guarantee that the interviews conducted give a representative picture of the whole organisation, for instance, there may be variations in centres across national boundaries. This study has already uncovered variations in strategies and structures going down three levels, involving a diversity of accountants and managers at different levels and units. But there remains the possibility of further variations below these levels. A second limitation is that the study is a single case study, even if embedded. Therefore, greater ecological validation can be achieved by replication of the study in other cases. In particular, refinements in the hypotheses may be applicable to other companies generating intellectual capital intensive projects/products.

Both of the above limitations are a natural consequence of the methods chosen in

this study, that is, any single qualitative study will suffer these limitations. However, there are two further limitations particular to this study. The earlier interviews, as a result of the inexperience of the interviewer, where not as informative as later interviews. Consequently the information on the sales and production units is not as rich as that obtained for research and development. In addition, although the accounting and supply chain personnel were helpful, attempts to gain access to management personnel in production failed.

An additional limitation is the relative absence of triangulation in the study. There are three ways in which triangulation could be increased. By interviewing a wider collection of individuals, although this study has interviewed main contact managers and accountants as themes and stories began to emerge. Other qualitative data collection methods could have been used, most obviously observations of development project team meetings, but time and distance constrained this from being implemented. Lastly, more public domain data may be used, although information on strategy, structure, and management practices of child units is rarely given in the public domain and segmental reposting is limited.

9.3 Future Work

Unsurprisingly, given its exploratory nature, new questions have arisen from the insights offered by this study. Thus it follows that a number of new research paths are suggested, along with a number of guiding considerations for any future research.

Both Eccles & Spicer have demonstrated a fit at the overall organisation level. In DrugCo we see cost centres with protected transfers, and this is associated with a organisation that has a strategy of high vertical integration & low diversification, and both asset specificity & uncertainty are generally high. However, both have failed to predict the finer grained strategies, structures, and accounting systems found in this study. Overall, the need for future case studies

to outline the finer grained systems beyond the corporate level are required. This study has found a diversity of "cost centre"s. Can a similar diversity of profit centres be found? Can subtleties be found between the concepts of cost centre and profit centre? However, before such research can be undertaken a number of issues need to be considered.

9.3.1 Cost as a Performance Measure

One of the more surprising findings of this study was the distinction between the absolute and relative importance of cost in performance measurement[89]. However the relationship between cost based KPI's and other KPI's needs investigation. Firstly, Widener's (2004) survey found that on average managers reported that traditional measures were important, regardless of the levels of strategic human capital. In particular the mean response for the importance of "meeting budgeted financial targets in your organization" was 6.05 (in a range of 1 to 7). This has lead Widener to suggest that traditional performance measures (such as cost based KPIs) and non-traditional measures may be complimentary. However, this study suggests that if the importance of financial measures is judged relative to non-financial, then the former decreases as uncertainty and human capital increase. Put another way, if traditional and non-traditional measures are complementary, as Widener suggests, we would expect to see that as human asset specificity and uncertainty increase, the relative importance of non-traditional KPI's increase, but never to the point where they supersede traditional KPI's. On the other hand, if the measures are substitutes, then we would expect to see them switch in their relative importance.

Since a distinction between absolute importance and relative importance is important for some concepts, this raises questions regarding survey measures. In particular how should questions and response options be formulated to obtain the relative value of a concept rather than the absolute? More importantly it may be

89 This reflects the difficulties noted by Snow & Hambrick (1980) when measuring strategy: "We have encountered ... several unanticipated problems in our research that have stemmed from the relativity of the strategies observed." p. 529.

that KPI's are subject to evolutionary mechanisms, with accountants and managers playing roles in promoting and demoting different KPIs. The evolutionary nature of KPI's may be an interesting areas for future research.

9.3.2 Transaction Cost Economics

Considerable time has been spent discussing the various forms of capital of the company and the specificity of that capital to the company, especially human, site, and temporal capital. Numerous dimensions of human capital have been discussed, including the importance of human capital at both the level of individual personnel and in multi-person structures. The causality of specific human capital and the utility of non-market forms of integration has been questioned.

So where does this leave transaction cost economics? The simple answer is that although the causality of capital specificity has been questioned, specific capital even as an endogenous variable still does play an important role in the conceptual landscape, and therefore must be included in future research that aims to understand and explain the use of accounting information systems, including cost allocation to projects and products. This suggests more research and thought is required to understand the role of specific capital and team structures in controlling internal flows of goods & services.

However, there are still plenty of questions. Can the specificity of capital, especially human, be measured, possibly by attitudinal type questions? Can less direct measurement instruments than interviews be developed? It has also been shown that the forms of specific capital are related to one another, the most obvious example being human and site capital. Can further relationships be found? Of course these questions are not directly related to accounting, but nevertheless they must be answered for progress to be made in understanding the role of TCE in explaining accounting systems.

9.3.3 Qualitative Research vs. Quantitative Research

The embedded nature of the case has helped with the development of the hypotheses covered in this chapter. Without these different units the comparisons between the units would not have been possible. The differentiation of the objectives (hypothesis 1a), strategies & structures (hypothesis 1b), and cost allocation systems(hypothesis 2a), is one of the first revelations of this research, and proved against both the expectations of this researcher and others[90].

Hopefully this framework will give new researchers a set of specific hypotheses and a guide for conducting case studies. The new framework shows that as project fluidity increases in parts of a company, integration is pushed down to lower levels of the company and less integration is achieved at higher levels (hypothesis 1c), and consequently cost allocation has increasingly less utility (hypotheses 2d and 2e). In addition, it is hoped that this study will encourage the use of the embedded case study in future research, where the researcher starts at the top of the organisation, and works their way down the organisational hierarchy, uncovering the differences between units at each level, and the relationship between the units at each level with their parent and child units.

To some extent this goes some way to answering Emmanuel & Mehafdi's (2001) concerns over prior transfer pricing research, namely the use of questionnaires that treated organisations as homogeneous wholes. However, this leaves the troublesome problem of ever obtaining quantitative data that will provide a quantitative and representative validation of accounting theory. One answer is that we need not concern ourselves with such a validation, but instead concentrate on providing an ecological validation based on case study research. A number of embedded case studies in different industries would provide an analytical generalisation. Gill & Johnson (1997) define ecological validity as

90 A opinion was made at the EAA doctoral colloquium 2002, that pharmaceutical companies have tight control systems that would not allow for variation.

"the extent to which it is possible to generalize from the actual social context in which the research has taken place and date thereby gathered, to other contexts and settings." Gill & Johnson argue that qualitative case study research has greater ecological validity because the researcher is less likely to overlook important variables compared to a researcher using methods that have less direct contact with the real subject's context. Therefore the results of the research, although less representative of a given population than can be achieved with survey methods, are likely to have greater analytical applicability in new case settings which have similar contexts.

9.4 Conclusion

We have come a long way in this thesis. We have found that measurement of the key variables, the understanding of what the conceptual variables look like from the perspective of accountants & managers, has not always been what was expected from reference to the literature. This resulted in the change of direction and methods used in this case study. Although the enriched framework presented here is partial, hopefully it will, along with the specific hypotheses, provide researchers with a guide for future embedded case research into accounting information systems.

This case has demonstrated that the assumption that companies have homogeneous objectives, strategies, structures, and accounting information systems, does not hold in every case. Different interpretations of parent unit objectives by sibling units, lead to differences in strategy and structure between those sibling units. A pattern found at a number of levels of the organisation. Uncertainty, in particular the fluid nature of projects has led to less integration of technical disciplines in research compared to development. The utility of calculating project costs by cost allocation has been found to vary accordingly, at times playing an integral part in the organisation's integrative mechanisms, demonstrating a link between the accounting information system and the structure. More remarkably, we have seen that in research, costs are not

allocated to projects, therefore there are no costs for individual projects only an average cost per project, a statistic that is regarded with caution.

The frameworks of Eccles, Spicer, and van der Meer-Kooistra have been shown to fit at the overall organisational level, but have also be shown to be incomplete when a more granular view of the organisation is taken. Eccles fails to appreciate the variance in strategies within individual companies, whereas Spicer and van der Meer-Kooistra perhaps underestimate the importance of uncertainty in driving controls. Lastly, the latter two assume that cost allocation will exist, that is provide useful information, yet in this study we have found that not to always be true.

Appendix A Questions From 3 Different Interviews

Development Manager

Centre Type / Profit Objective / Cost Allocation

1 How do departments allocate their costs to projects?
2 What costs are allocated to projects?
  2.1 What elements are included?
3 Are standard or actual costs allocated?
  3.1 Exceptions?
4 Who creates the standards?
5 Is there a company wide formula?
  5.1 Exceptions?
6 Is there variance in the sophistication?
7 What are the managers of the department held accountant for?
  7.1 How much responsibility do they have?
8 Do you operate as a cost centre?
9 What do you understand from that, what do you mean by that?

Sourcing

1 Do you provide services to outside parties?
  1.1 Exceptions?
2 Are there alternative outside suppliers of the service you provide?
3 Why are outside services used?
  3.1 Expertise
  3.2 Reduction of risk
  3.3 Strategic Strategic Sourcing
4 Who decides on the sourcing between internal and external services?
  4.1 Project teams?
5 Are sourcing decisions centralised?

6 What rules are used?
7 Who creates the rules?
8 Are you required to meet internal demand?
9 What happens if there is a conflict between the demand of two or more projects?
10 What influences do project teams have on the investments of your department?

Asset Specificity

1 Are physical assets ever specific to a particular project?
2 How much learning is specific to a particular project?
3 How much capacity can be taken up by a project?

Performance Measurement

1 Multiple KPIs used?
2 Qualitative information used?
3 Is a composite created?
4 What weights are used?
5 How much subjectivity is used in assessing KPIs?
6 Style of evaluation?
  6.1 Budget constrained
  6.2 Profit conscious
  6.3 Non-accounting
7 How experienced are senior management? How much do they understand about the department?

Benchmarking

1 To what degree are comparisons made between KPIs and other departments and external sources?

2 How easily is information gained for benchmarking?

Bonuses

1 Do bonuses have a significant corporate element?
2 What is the composition of the bonuses?
3 Composite created from KPIs?

Research & Development Manager

Company Strategy

1. What is the company's strategy?

Resource Allocation / Sourcing Decisions

1. Who would you say has the influence in that process?
2. How high up would you say these decisions go?
3. Centralisation of investment and sourcing decisions

Cost Allocation

1. How are research and development costs allocated projects?
2. Purposes in allocation to projects
3. So would you say some of this information flows back into the decision making?
4. What elements are allocated?
5. Standard or actual cost?
6. Actual hours at standard rate?
7. Is any cost of capital included?
8. Is ABC used?
9. Who sets the standard for labour?
10. Who sets those standards?
11. Who is responsible for setting those standards?

PMERS & Benchmarking

1. Is balanced scorecard used?
2. How many items are included?

3. How are the functions performances measured?

4. How would you measure the performance of those subunits or functions?
5. Are comparison made with competitors?

6. Personal/company mix?

7. Selling to external parties?
8. Buying from external parties?
9. Reasons for buying from external parties?
10. Relationship with external parties?

11. Comparable external suppliers?
12. Those internal functions still treated as cost functions?
13. Is the external price used for internal pricing or performance measurement?

14. Benchmarking?
15. Cost of capital used in benchmarking studies???

Performance Evaluation

1. Would one of the cost be the cost of capital?
2. So the costs do follow the projects?
3. Is the cost system a homogeneous system for the company?
4. Some companies would treat a lot of their functions as separate companies, as far as I understand it?

Development Project Manager

Diversification

1 Value chain – pipeline
2 Do projects to develop a candidate drug move through functions sequentially or consecutively?

Asset Specificity

1 Are there alternative external suppliers of the services Process R&D provides to projects?

Physical Assets

1. Are some physical assets used primarily for a single project?
2. Are these costed in any other way?
3. How easily are physical assets shifted from one project to another?
4. Are the physical assets only valuable/useful to AstraZeneca?

Dedicated Asset Specificity

1. Are the skill types so large in their capacity, outside sources would be insufficient to cover the services provided?

Human Asset Specificity

1. How easily are people moved from one project to another?
2. Are some individuals critical to a project?
3. How wide are the skills within the Process R&D function?
4. How often do you need to go to outside sources due to the lack of internal expertise?

Organisation of AstraZeneca

1. Why is development organised as a matrix, while research is organised as a simpler hierarchy for each TA?
2. It appears that departments within research have an easier time moving people to projects than development, even though functions within development span all TAs. Is this a correct interpretation? Why is this so?

Uncertainty

1. Which do you find it easier to control, internal or external work? Why?

Performance Measurement

1. What measures are used to measure the performance of project management?
2. Do these include quantitative but non-financial measure?
3. Do these include qualitative elements/measures?
4. Is a composite created from the difference measures?
    1. Weights used?
5. How much subjectivity is brought into the evaluation of performance by senior management?
6. How experienced is management?
7. Do the measures vary between:
    1. Project?
    2. Skill types?
    3. Location?
8. Does evaluation vary?

Projects

1. How much influence do costs have in the decision to discontinue projects?

Appendix B – Questionnaire

Domestic Transfer Pricing

Introduction

We would like you to concentrate on a single physical product which is sold by your subunit to one or more internal buyers (there may also be external buyers). This product will henceforth be referred to as the "Intermediate Product".

Now concentrate on one of the internal buyers of the intermediate product, which buys the intermediate product on a frequent, recurring basis. This internal buyer will henceforth be referred to as the "Buying Subunit".

Please tick the appropriate boxes in the following sections.

Section A - Subunit Characteristics

A.1. What is the annual turnover (sales) of your subunit?_____

A.2. Which is the most important accounting basis for measuring the performance of your subunit?

- ☐ Investment Centre: Profit relative to capital employed
- ☐ Profit Centre: Revenues less costs
- ☐ Cost Centre
- ☐ Other, please specify

A.3. Does your subunit have a objective of earning a profit on the intermediate product?

- ☐ Yes, substantial profit
- ☐ Yes, but minor profit
- ☐ No

Section B - The Flow of the Intermediate Product

On the following page you will see four diagrams, which represent the flow of the intermediate product from your subunit, to the buying subunit and other buyers. Other buyers can be other subunits within your company or external buyers. Under each is a description of the flow.

The diagrams make reference to **similar** products. These are defined as:

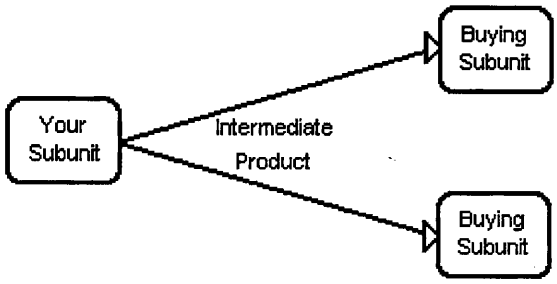
- Products that buyers find easy to substitute for each other

&/or

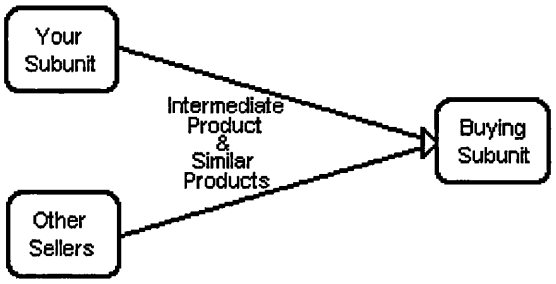
- Products that tend to use similar assets in their production

Please tick the box to the right-hand side, which best represents the flow that occurs. If none are appropriate, please draw your own diagram in the space provided at the end of the section.

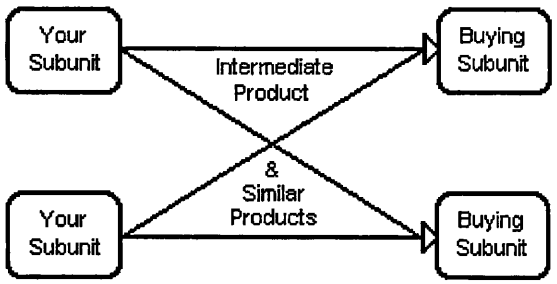
Your subunit supplies an idiosyncratic intermediate product, which has neither any similar competitor products (internal or external), nor is applicable to any other buyer (internal or external).



Your subunit supplies the intermediate product or similar products to buyers other than the buying subunit of this particular transfer. No similar products are supplied by other subunits within the company, or by other companies.



The intermediate product is or can by supplied by several other suppliers to the single buying subunit. The sellers can be subunits within the company or other companies.



The intermediate product is or can be supplied by several suppliers to several buyers. The sellers and buyers can be subunits within the company or other companies.

Alternative flow diagram. None of the above are appropriate.

B.2. Is the intermediate product part of a chain of products within your company, which start from raw materials to a complete final product?

☐ Yes ☐ No ☐ Don'tKnow

B.3. How many of the above type of chains does your subunit produce products for?_____

Section C - The Size of Trading

C.1. For your subunit please give the approximate value of sales revenue under the seven categories below.

		£ or %
The Intermediate Product & Similar Products	The Buying Subunit	
	Other Subunits	
	External Buyers	
Other Products	The Buying Subunit	
	Other Subunits	
	External Buyers	
Other Sources of Revenue		
	Approximate Total	

C.2. For your subunit please give the approximate number of buyers of the products under the four categories below. (Note this may result in some buyers being counted twice, since they purchase both the intermediate product and other products)

		No.
The Intermediate Product & Similar Products	Other Subunits	
	External Buyers	
Other Products	Other Subunits	
	External Buyers	

C.3. Is the volume of the intermediate product transferred to the buying subunit so large that other buyers (internal & external) could not absorb the volume of product involved?

☐ Yes ☐ No ☐ Don't know

Section D - Physical Assets

This section refers to the physical assets, including machinery, plant, vehicles, etc., which are owned by your subunit, and are used in the production, supply and service of the intermediate product.

D.1. What percentage of the physical assets can only be used for the intermediate product?

☐ 0-9% ☐ 10-19% ☐ 20-29% ☐ 30-39% ☐ 40-49%
☐ 50-59% ☐ 60-69% ☐ 70-79% ☐ 80-89% ☐ 90-100%

D.2. What percentage of the physical assets, would be difficult to use efficiently elsewhere?

☐ 0-9% ☐ 10-19% ☐ 20-29% ☐ 30-39% ☐ 40-49%
☐ 50-59% ☐ 60-69% ☐ 70-79% ☐ 80-89% ☐ 90-100%

D.3. What is the value of the physical assets in alternative uses (as a percentage of the value used in the production and transfer of the intermediate product)?

☐ 0-9% ☐ 10-19% ☐ 20-29% ☐ 30-39% ☐ 40-49%
☐ 50-59% ☐ 60-69% ☐ 70-79% ☐ 80-89% ☐ 90-100%

D.4. Are any physical assets located next to or near the buying subunit's assets?

☐ Yes - please answer the next questions
☐ No - please skip to the next section – Section E - Human Capital

D.5. What percentage of the physical assets have been located next to or near the buying subunit's assets?

☐ 0-9% ☐ 10-19% ☐ 20-29% ☐ 30-39% ☐ 40-49%
☐ 50-59% ☐ 60-69% ☐ 70-79% ☐ 80-89% ☐ 90-100%

D.6. If significant assets have been located next to the other subunit's assets, how costly would it be to move the majority of these assets?

At Low Cost ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 At Great Cost or Can't Be Moved

D.7. Are there other buyers/suppliers located nearby?

☐ Yes ☐ No ☐ Don't Know

D.8. How important, in terms of cost efficiency, would you rate the proximity of the buying subunit?

Not Important ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Crucially Important

Section E - Human Capital

E.1. For the intermediate product, how much special training of operators/supervisors/managers in the subunit has been required?

None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Extensive

E.2. How much special training of operators/supervisors/managers in the subunit does the intermediate product continue to require?

None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Extensive

E.3. What was the cost of R&D by the subunit for this intermediate product?

None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Very Costly

E.4. How much engineering effort has been invested in designing the intermediate product?

None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Very Costly

E.5. To what degree are the skills, knowledge & experience of the workers, specific to this intermediate product?

None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Mainly Specific to this Intermediate Product

Section F - The Importance of Timing

F.1. How much has been invested in ensuring on time deliveries of the intermediate product to the buying subunit are achieved at specific times?

None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 Extensive

Section G - Uncertainty & Complexity

G.1. How frequently do unforeseen events occur which require significant changes in the transfer of the intermediate product (Quantity, specifications, prices, delivery times, etc.)?

☐ At least once a day ☐ At least once a week ☐ At least once a month
☐ 6 to 11 times a year ☐ 2 to 5 times a year ☐ At least once every 5 years
☐ More than 5 years

G.2. To what extent are significant fluctuations in the quantities required by the buying subunit estimated to occur?

None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Extensive

G.3. To what extent are the quantity estimates in the previous question considered to be uncertain?

None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Extensive

G.4. How frequently are changes expected in the specifications of the intermediate product?

☐ Once a month ☐ 6 to 11 times a year ☐ 2 to 5 times a year
☐ At least once every 5 years ☐ Less than every 5 years

G.5. What is the possibility of significant future technological improvements in the intermediate product in the next 5 years?

None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Certain

G.6. How soon do you expect significant technological improvements in the intermediate product to occur?

☐ In the next month ☐ In the next 6 months ☐ In the next year
☐ In the next 5 years ☐ After the next 5 years ☐ Never

G.7. How important is low manufacturing cost for the intermediate product?

Not Important ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Critically Important

G.8. How important is advanced technology for the intermediate product?

Not Important ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Critically Important

Section H - Subunit Autonomy

H.1. How centralised is the sourcing decision of the intermediate product?

Entirely Centralised ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Entirely Negotiated

Entirely Centralised: Decision made by senior management without reference to the managers of the subunits.
Entirely Negotiated: Decision by negotiation between managers of the subunits without reference senior management.

H.2. How much discretion does your subunit have in selling the intermediate product to other buyers?

☐ No discretion: Central management chooses
☐ Freedom to choose, but subject to central approval and considerable scrutiny
☐ Freedom to choose, but subject to central approval, but usually little scrutiny
☐ Full discretion
☐ Other, please specify

H.3. Is it a requirement that all internal demand must be meet before selling externally?

☐ Yes ☐ No

H.4. To your knowledge, how much discretion does the buying subunit have in buying the intermediate product from other sources?

☐ No discretion: Central management chooses
☐ Freedom to choose, but subject to central approval and considerable scrutiny
☐ Freedom to choose, but subject to central approval, but usually little scrutiny
☐ Full discretion
☐ Don't know
☐ Other, please specify

H.5. To your knowledge, is it necessary for the buying subunit to source internally before buying externally?

☐ Yes ☐ No ☐ Don't know

H.6. How are transfer prices determined for the transaction?

H.7. How centralised is the determination of the transfer price?

Entirely Centralised ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Entirely Negotiated

Entirely Centralised: Prices set down by senior management without reference to the managers of the subunits.
Entirely Negotiated: Prices developed by negotiation between managers of the subunits without reference to senior management.

H.8. How much discretion does your subunit and the other subunit have in setting the transfer price?

☐ No discretion: Central management chooses
☐ Freedom to choose, but subject to central approval and considerable scrutiny
☐ Freedom to choose, but subject to central approval, but usually little scrutiny
☐ Full discretion
☐ Other, please specify

H.9. Who usually determines the transfer price for the intermediate product?

☐ Senior management alone
☐ Senior management through consultation with subunits
☐ Between subunits, but with senior management as arbitrator
☐ Between subunits, with senior management involvement
☐ Finance/accounting department
☐ Other, please specify

H.10. Who usually reviews the transfer price for the intermediate product?

☐ Senior management alone
☐ Senior management through consultation with subunits
☐ Between subunits, but with senior management as arbitrator
☐ Between subunits, with senior management involvement
☐ Finance/accounting department
☐ Never reviewed after being set the in budget
☐ Other, please specify

H.11. To what extent does senior management scrutinise the activities surrounding the transfer (production of the intermediate product, transportation, servicing, use of the product, etc)?

No Scrutiny ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Very Close Scrutiny

H.12. To your knowledge, has any of your superiors been managers of a subunit involved in the trading of the intermediate product in the past 5 years?

☐ Yes ☐ No ☐ Don't know

H.13. To your knowledge, how much experience & knowledge has senior management of the transfer, including the production techniques, the product's specification, types of problem that can occur, etc.?

None ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Extensive

H.14. How frequently do discussions occur between your subunit and the buying subunit's management over the transfer, whether it is product specification, prices, quality, etc.?

Never ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Frequently

Section I - Performance Measurement, Evaluation, and Reward System

I.1. What criteria are used to measure the performance of the intermediate product in the achieving the company's overall goals? (Please specify all significant measures which are used, by ticking all relevant boxes)

☐ Sales
☐ Residual Income
☐ Share of Market
☐ Delivery Timing
☐ Operating Profit
☐ EVA
☐ Employee Turnover & Welfare
☐ Other, please specify
☐ Net Profit
☐ Return on Investment
☐ Quality Assessment of Product

I.2. What amount of discretion does senior management have and exercise in judging the performance of your subunit as regards the intermediate product?

☐ No discretion is exercised. Evaluation is based mechanistically on the performance measure(s)
☐ Discretion is only exercised occasionally **or** only small adjustments are made to the performance measure(s)
☐ Discretion is exercised regularly **and** large adjustments to the performance measures are made
☐ Judgement is mainly a subjective matter, in which the performance measure(s) is(are) only a guide
☐ Other, please specify

I.3. To what degree are the rewards of the subunit's management based on the performance product?

☐ Exclusively
☐ Mainly the products performance
☐ A balance of product & company performance
☐ Mainly the company's performance
☐ Only the company's performance

I.4. To what degree are rewards based on the joint performance of both your subunit and the buying subunit?

Solely Based on Your Subunits Performance ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Wholly Based on Joint Performance

Section J - Transfer Price Base

J.1. On what base are internal transfers priced?

Cost of Production

- ☐ Actual Variable Costs
- ☐ Standard Variable Costs
- ☐ Actual Full Costs
- ☐ Standard Full Costs
- ☐ Full Cost Plus a Fixed or Percentage Profit Margin
- ☐ Full Cost Plus a Negotiated Profit Margin

External Market Prices

- ☐ Average Market Price
- ☐ Lowest Market Price
- ☐ Market Price Adjusted by a Fixed Amount or Percentage
- ☐ Market Price Altered by Negotiation

☐ Other, please specify

Section K - Fairness & Equity

K.1. To what degree do you feel that the transfer pricing system disadvantages your subunit relative to the buying subunit?

Not Fair ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Very Fair

K.2. How equally do you feel your subunit is treated relative to the buying subunit?

Not Equally ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 About Equal

K.3. How satisfied are you with the current transfer pricing system?

Totally Satisfied ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 Totally Dissatisfied

Section L - Further

L.1. Would you be willing to further discuss the issues raised in this questionnaire?

☐ Yes ☐ No

L.2. Would you like to receive a copy of the report analysing the responses to this questionnaire?

☐ Yes ☐ No

If you have answered yes to either of the above two questions, please complete the remainder of this section

Name _____

Address _____

_____

_____

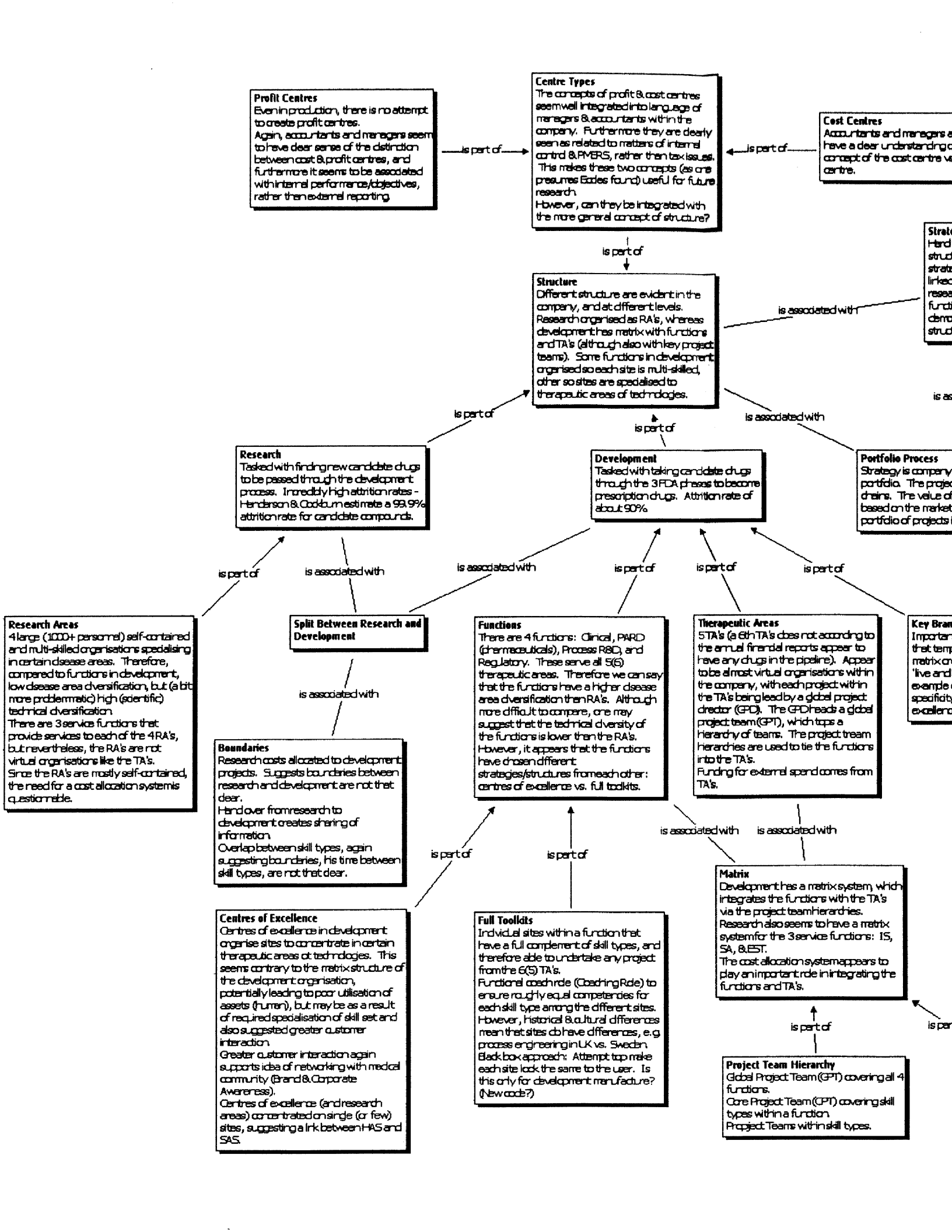
_____

Telephone No _____

E-mail Address _____

Thank you for completing this questionnaire. All resposes are treated with strict confidentiality.

Appendix C - Altas.ti Network Diagrams


Profit Centres
Even in production, there is no attempt to create profit centres.
Again, accountants and managers seem to have clear sense of the distinction between cost & profit centres, and furthermore it seems to be associated with internal performance/objectives, rather than external reporting
is part of
Centre Types
The concepts of profit & cost centres seem well integrated into language of managers & accountants within the company. Furthermore they are clearly seen as related to matters of internal control & PMERS, rather than tax issues. This makes these two concepts (as one presumes Eccles found) useful for future research.
However, can they be integrated with the more general concept of structure?
is part of
Cost Centres
Accountants and managers a
have a clear understanding o
concept of the cost centre v
centre.
is part of
Structure
Different structure are evident in the company, and at different levels.
Research organised as RA's, whereas development has matrix with functions and TA's (although also with key project teams). Some functions in development organised so each site is multi-skilled, other so sites are specialised to therapeutic areas of technologies.
is associated with
Strat
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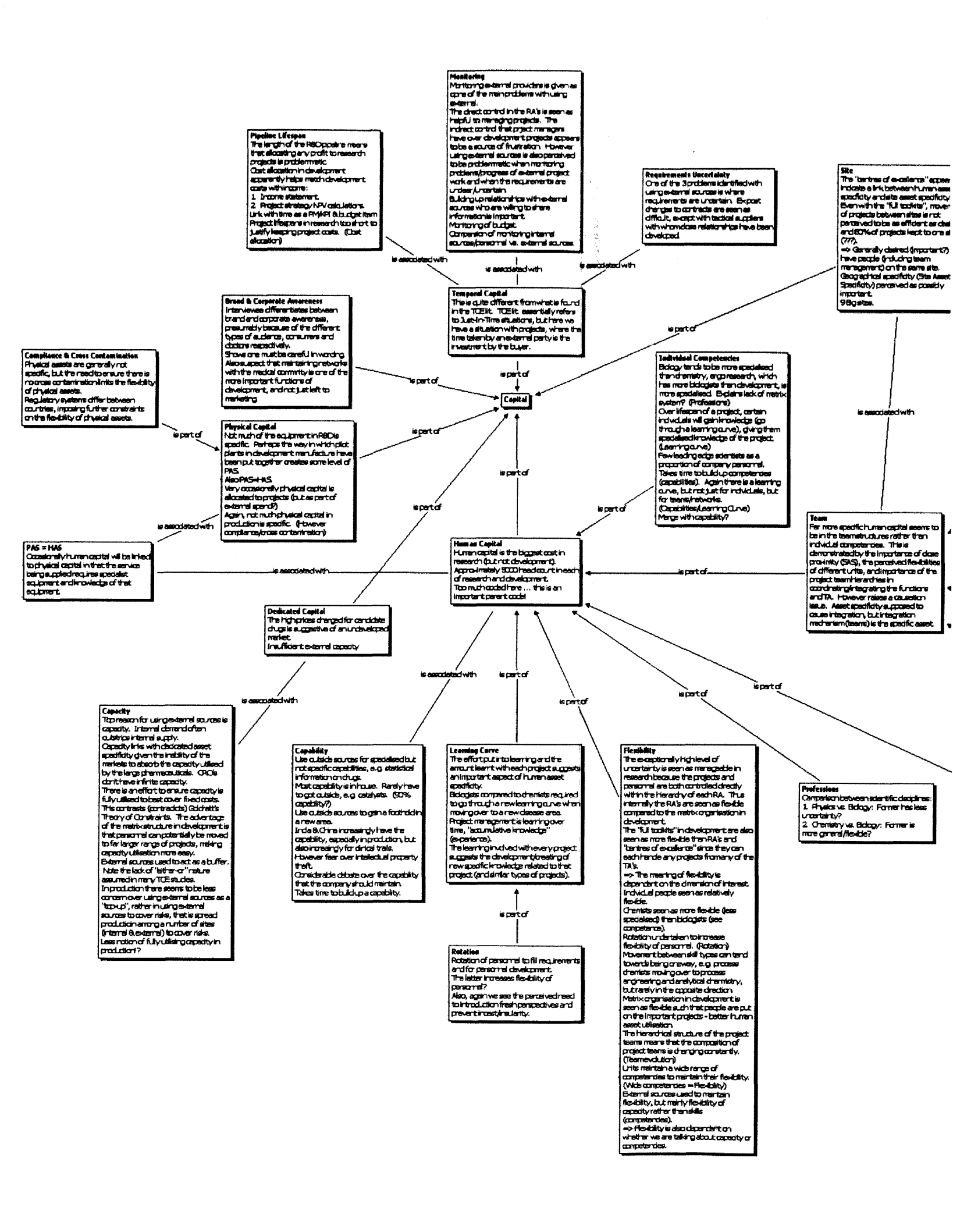
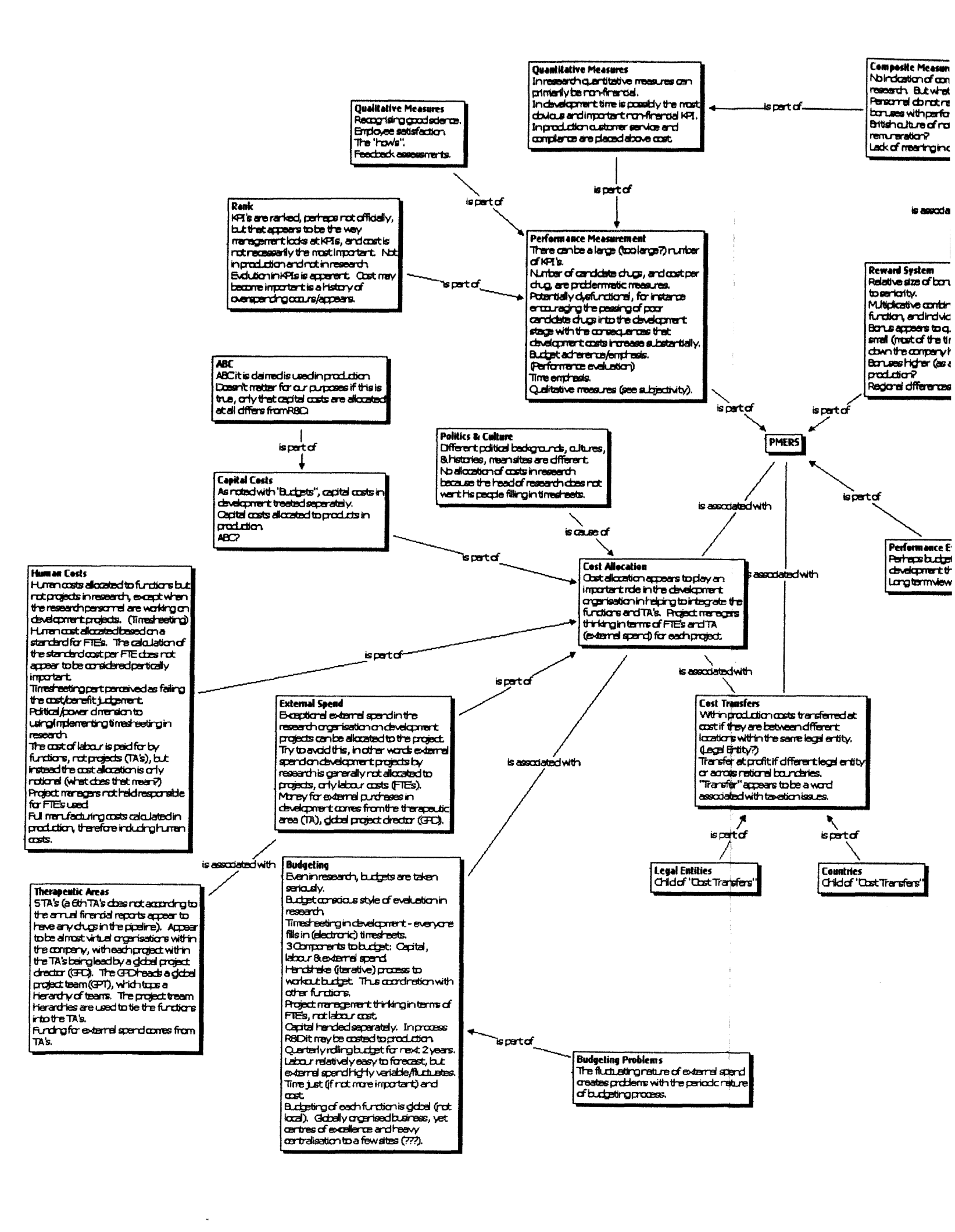
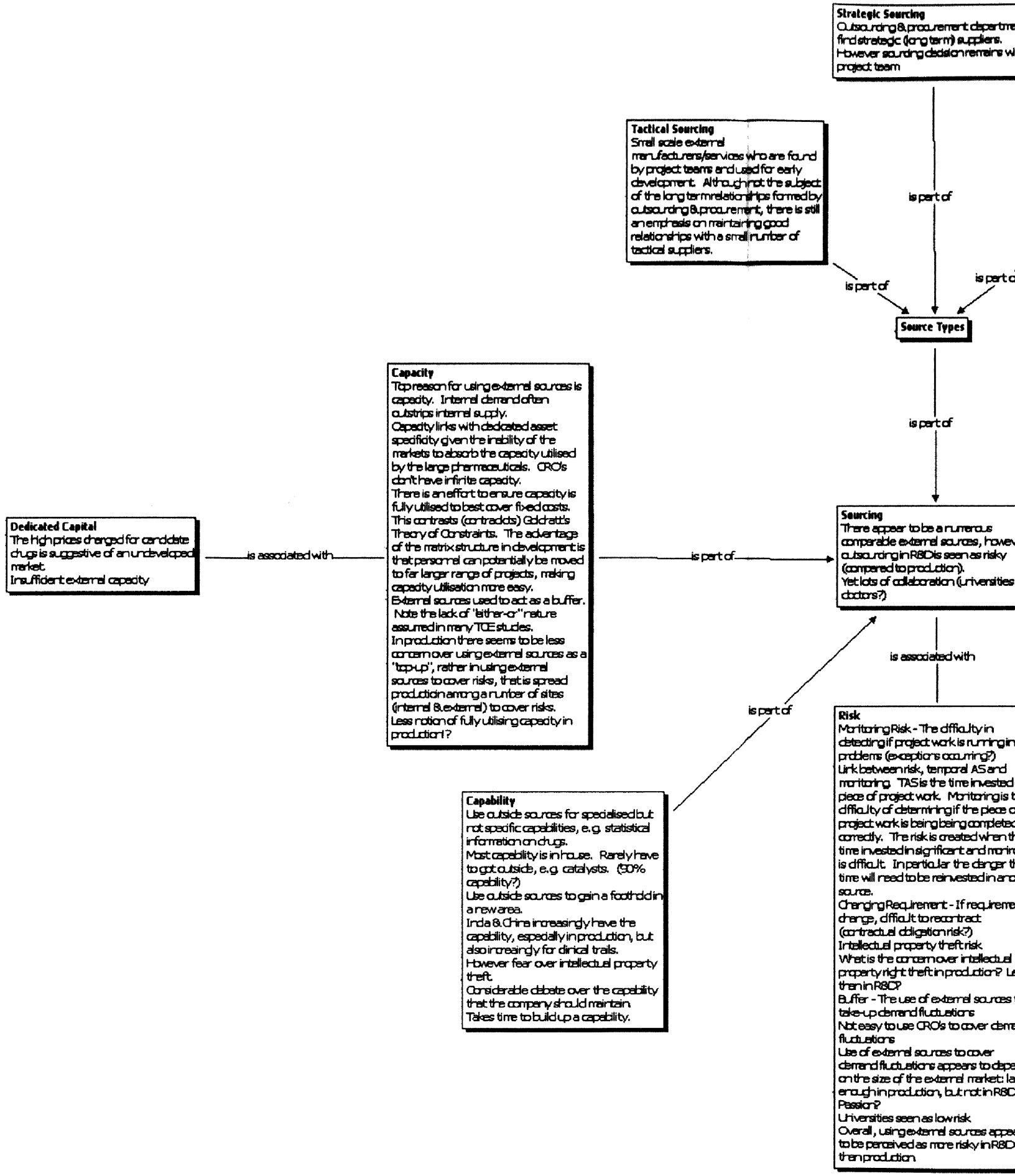
is part of
is part of
is associated with
Research
Tasked with finding new candidate drugs to be passed through the development process. Incredibly high attrition rates - Henderson & Cockburn estimate a 99.9% attrition rate for candidate compounds.
Development
Tasked with taking candidate drugs through the 3 FDA phases to become prescription drugs. Attrition rate of about 90%
Portfolio Process
Strategy is company
portfolio. The proje
chains. The value o
based on the market
portfolio of projects
is part of
is associated with
is associated with
is part of
is part of
is part of
Research Areas
4 large (1000+ personnel) self-contained and multi-skilled organisations specialising in certain disease areas. Therefore, compared to functions in development, low disease area diversification, but (a bit more problematic) high (scientific) technical diversification
There are 3 service functions that provide services to each of the 4 RA's, but nevertheless, the RA's are not virtual organisations like the TA's.
Since the RA's are mostly self-contained, the need for a cost allocation system is questionable.
Split Between Research and Development
is associated with
Functions
There are 4 functions: Clinical, PARD (pharmaceuticals), Process R&D, and Regulatory. These serve all 5(6) therapeutic areas. Therefore we can say that the functions have a higher disease area diversification than RA's. Although more difficult to compare, one may suggest that the technical diversity of the functions is lower than the RA's. However, it appears that the functions have chosen different strategies/structures from each other: centres of excellence vs. full toolkits.
Therapeutic Areas
5 TA's (a 6th TA's does not according to the annual financial reports appear to have any drugs in the pipeline). Appear to be almost virtual organisations within the company, with each project within the TA's being lead by a global project director (GPD). The GPD heads a global project team (GPT), which tops a hierarchy of teams. The project team hierarchies are used to tie the functions into the TA's.
Funding for external spend comes from TA's.
Key Bran
Importan
that tem
matrix cr
'live and
example
specificity
excellenc
Boundaries
Research costs allocated to development projects. Suggests boundaries between research and development are not that clear.
Hand over from research to development creates sharing of information
Overlap between skill types, again suggesting boundaries, his time between skill types, are not that clear.
is part of
is part of
is associated with
is associated with
Centres of Excellence
Centres of excellence in development organise sites to concentrate in certain therapeutic areas of technologies. This seems contrary to the matrix structure of the development organisation, potentially leading to poor utilisation of assets (human), but may be as a result of required specialisation of skill set and also suggested greater customer interaction
Greater customer interaction again supports idea of networking with medical community (Brand & Corporate Awareness).
Centres of excellence (and research areas) concentrated on single (or few) sites, suggesting a link between HAS and SAS.
Full Toolkits
Individual sites within a function that have a full complement of skill types, and therefore able to undertake any project from the 6(5) TA's.
Functional coach role (Coaching Role) to ensure roughly equal competencies for each skill type among the different sites.
However, historical & cultural differences mean that sites do have differences, e.g. process engineering in UK vs. Sweden
Black box approach: Attempt to make each site look the same to the user. Is this only for development/manufacture? (New code?)
Matrix
Development has a matrix system, which integrates the functions with the TA's via the project team hierarchies.
Research also seems to have a matrix system for the 3 service functions: IS, SA, & EST.
The cost allocation system appears to play an important role in integrating the functions and TA's.
is part of
is par
Project Team Hierarchy
Global Project Team (GPT) covering all 4 functions.
Core Project Team (CPT) covering skill types within a function.
Project Teams within skill types.


Monitoring
Monitoring external providers is given as one of the main problems with using external.
The direct control in the RA's is seen as helpful to managing projects. The indirect control that project managers have over development projects appears to be a source of frustration. However using external sources is also perceived to be problematic when monitoring problems/progress of external project work and when the requirements are unclear/uncertain.
Building up relationships with external sources who are willing to share information is important.
Monitoring of budget.
Comparison of monitoring internal sources/personnel vs. external sources.
Pipeline Lifespan
The length of the R&D pipeline means that allocating any profit to research projects is problematic.
Cost allocation in development apparently helps match development costs with income:
1. Income statement.
2. Project strategy/NPV calculations.
Link with time as a PM/KPI & budget item
Project lifespans in research too short to justify keeping project costs. (Cost allocation)
Requirements Uncertainty
One of the 3 problems identified with using external sources is where requirements are uncertain. Ex-post changes to contracts are seen as difficult, except with tactical suppliers with whom close relationships have been developed
Site
The "centres of excellence" appear to indicate a link between human asset specificity and site asset specificity. Even with the "full toolkits", movement of projects between sites is not perceived to be as efficient as desired and 60% of projects kept to one site (???).
=> Generally desired (important?) to have people (including team management) on the same site.
Geographical specificity (Site Asset Specificity) perceived as possibly important.
9 Biggates.
is associated with
is associated with
is associated with
Temporal Capital
This is quite different from what is found in the TCE lit. TCE lit. essentially refers to Just-In-Time situations, but here we have a situation with projects, where the time taken by an external party is the investment by the buyer.
is part of
Broad & Corporate Awareness
Interviewee differentiates between brand and corporate awareness, presumably because of the different types of audience, consumers and doctors respectively.
Shows one must be careful in wording.
Also suspect that maintaining networks with the medical community is one of the more important functions of development, and not just left to marketing
is part of
Compliance & Cross Contamination
Physical assets are generally not specific, but the need to ensure there is no cross contamination limits the flexibility of physical assets.
Regulatory systems differ between countries, imposing further constraints on the flexibility of physical assets.
is part of
Capital
Individual Competencies
Biology tends to be more specialised than chemistry, ergo research, which has more biologists than development, is more specialised. Explains lack of matrix system? (Professions)
Over lifespan of a project, certain individuals will gain knowledge (go through a learning curve), giving them specialised knowledge of the project. (Learning curve)
Few leading edge scientists as a proportion of company personnel.
Takes time to build up competencies (capabilities). Again there is a learning curve, but not just for individuals, but for teams/networks.
(Capabilities/Learning Curve)
Merge with capability?
is part of
Physical Capital
Not much of the equipment in R&D is specific. Perhaps the way in which pilot plants in development manufacture have been put together creates some level of PAS.
Also PAS=HAS.
Very occasionally physical capital is allocated to projects (but as part of external spend?)
Again, not much physical capital in production is specific. (However compliance/cross contamination)
is part of
is part of
is associated with
PAS = HAS
Occasionally human capital will be linked to physical capital in that the service being supplied requires specialist equipment and knowledge of that equipment.
is associated with
Human Capital
Human capital is the biggest cost in research (but not development).
Approximately 5000 head count in each of research and development.
Too much coded here ... this is an important parent code!
is part of
Team
For more specific human capital seems to be in the team structures rather than individual competencies. This is demonstrated by the importance of close proximity (SAS), the perceived flexibilities of different units, and importance of the project team hierarchies in coordinating/integrating the functions and TA. However raises a causation issue. Asset specificity supposed to cause integration, but integration mechanism (teams) is the specific asset.
Dedicated Capital
The high prices charged for candidate drugs is suggestive of an undeveloped market.
Insufficient external capacity
is associated with
is part of
is part of
is part of
is part of
is part of
Capacity
The reason for using external sources is capacity. Internal demand often outstrips internal supply.
Capacity links with dedicated asset specificity given the inability of the markets to absorb the capacity utilised by the large pharmaceuticals. CROs don't have infinite capacity.
There is an effort to ensure capacity is fully utilised to best cover fixed costs.
This contrasts (contradicts) Goldratt's Theory of Constraints. The advantage of the matrix structure in development is that personnel can potentially be moved to far larger range of projects, making capacity utilisation more easy.
External sources used to act as a buffer.
Note the lack of "either-or" nature assumed in many TCE studies.
In production there seems to be less concern over using external sources as a "top-up", rather in using external sources to cover risks, that is spread production among a number of sites (internal & external) to cover risks.
Less notion of fully utilising capacity in production?
Capability
Use outside sources for specialised but not specific capabilities, e.g. statistical information on drugs.
Most capability is in-house. Rarely have to go outside, e.g. catalysts. (90% capability?)
Use outside sources to gain a foothold in a new area.
In the BRIC nations increasingly have the capability, especially in production, but also increasingly for clinical trials.
However fear over intellectual property theft.
Considerable debate over the capability that the company should maintain.
Takes time to build up a capability.
Learning Curve
The effort put into learning and the amount learnt with each project suggests an important aspect of human asset specificity.
Biologists compared to chemists required to go through a new learning curve when moving over to a new disease area.
Project management is learning over time, "accumulative knowledge" (experience).
The learning involved with every project suggests the development/creating of new specific knowledge related to that project (and similar types of projects).
is part of
Rotation
Rotation of personnel to fill requirements and for personnel development.
The latter increases flexibility of personnel?
Also, again we see the perceived need to introduction fresh perspectives and prevent inbreeding/insularity.
Flexibility
The exceptionally high level of uncertainty is seen as manageable in research because the projects and personnel are both controlled directly within the Hierarchy of each RA. Thus internally the RA's are seen as flexible compared to the matrix organisation in development.
The "full toolkits" in development are also seen as more flexible than RA's and "centres of excellence" since they can each handle any projects from any of the TA's.
=> The meaning of flexibility is dependent on the dimension of interest.
Individual people seen as relatively flexible.
Chemists seen as more flexible (less specialised) than biologists (see competence).
Rotation undertaken to increase flexibility of personnel. (Rotation)
Movement between skill types can tend towards being one way, e.g. process chemists moving over to process engineering and analytical chemistry, but rarely in the opposite direction.
Matrix organisation in development is seen as flexible such that people are put on the important projects - better human asset utilisation.
The hierarchical structure of the project teams means that the composition of project teams is changing constantly. (Teamevolution)
Units maintain a wide range of competencies to maintain their flexibility. (Wide competencies = Flexibility)
External sources used to maintain flexibility, but mainly flexibility of capacity rather than skills (competencies).
=> Flexibility is also dependent on whether we are talking about capacity or competencies.
Professions
Comparison between identic disciplines:
1. Physics vs. Biology: Former has less uncertainty?
2. Chemistry vs. Biology: Former is more general/flexible?


Quantitative Measures
In research quantitative measures can primarily be non-financial.
In development time is possibly the most obvious and important non-financial KPI.
In production customer service and compliance are placed above cost.
is part of
Qualitative Measures
Recognising good science.
Employee satisfaction.
The 'how's'.
Feedback assessments.
is part of
is part of
Rank
KPI's are ranked, perhaps not officially, but that appears to be the way management looks at KPIs, and cost is not necessarily the most important. Not in production and not in research.
Evolution in KPIs is apparent. Cost may become important is a history of overspending occurs/appears.
is part of
Performance Measurement
There can be a large (too large?) number of KPI's.
Number of candidate drugs, and cost per drug, are problematic measures.
Potentially dysfunctional, for instance encouraging the passing of poor candidate drugs into the development stage with the consequences that development costs increase substantially.
Budget adherence/emphasis.
(Performance evaluation)
Time emphasis.
Qualitative measures (see subjectivity).
is part of
is part of
PMERS
Reward System
Politics & Culture
Different political backgrounds, cultures, & histories, mean sites are different.
No allocation of costs in research because the head of research does not want his people filling in timesheets.
ABC
ABC it is claimed is used in production.
Doesn't matter for our purposes if this is true, only that capital costs are allocated at all differs from R&D.
is part of
Capital Costs
As noted with 'Budgets", capital costs in development treated separately.
Capital costs allocated to products in production.
ABC?
is part of
is cause of
is associated with
is part of
Cost Allocation
Cost allocation appears to play an important role in the development organisation in helping to integrate the functions and TA's. Project managers thinking in terms of FTE's and TA (external spend) for each project.
is associated with
Human Costs
Human costs allocated to functions but not projects in research, except when the research personnel are working on development projects. (Timesheeting)
Human cost allocated based on a standard for FTEs. The calculation of the standard cost per FTE does not appear to be considered partically important.
Timesheeting part perceived as failing the cost/benefit judgement.
Political/power dimension to using/implementing timesheeting in research.
The cost of labour is paid for by functions, not projects (TA's), but instead the cost allocation is only notional (what does that mean?)
Project managers not held responsible for FTE's used.
Full manufacturing costs calculated in production, therefore including human costs.
is part of
is part of
External Spend
Exceptional external spend in the research organisation on development projects can be allocated to the project.
Try to avoid this, in other words external spend on development projects by research is generally not allocated to projects, only labour costs (FTEs).
Money for external purchases in development comes from the therapeutic area (TA), global project director (GPD).
is associated with
is associated with
Cost Transfers
Within production costs transferred at cost if they are between different locations within the same legal entity. (Legal Entity?)
Transfer at profit if different legal entity or across national boundaries.
"Transfer" appears to be a word associated with taxation issues.
is part of
is part of
Legal Entities
Child of 'Cost Transfers"
Countries
Child of 'Cost Transfers"
is associated with
Therapeutic Areas
5 TA's (a 6th TA's does not according to the annual financial reports appear to have any drugs in the pipeline). Appear to be almost virtual organisations within the company, with each project within the TA's being lead by a global project director (GPD). The GPD heads a global project team (GPT), which tops a hierarchy of teams. The project team hierarchies are used to tie the functions into the TA's.
Funding for external spend comes from TA's.
Budgeting
Even in research, budgets are taken seriously.
Budget conscious style of evaluation in research.
Timesheeting in development - everyone fills in (electronic) timesheets.
3 Components to budget: Capital, labour & external spend.
Handshake (iterative) process to workout budget. Thus coordination with other functions.
Project management thinking in terms of FTE's, not labour cost.
Capital handled separately. In process R&D it may be costed to production.
Quarterly rolling budget for next 2 years.
Labour relatively easy to forecast, but external spend highly variable/fluctuates.
Time just (if not more important) and cost.
Budgeting of each function is global (not local). Globally organised business, yet centres of excellence and heavy centralisation to a few sites (???).
is part of
Budgeting Problems
The fluctuating nature of external spend creates problems with the periodic nature of budgeting process.


Strategic Sourcing
Outsourcing & procurement departme
find strategic (long term) suppliers.
However sourcing decision remains wi
project team
Tactical Sourcing
Small scale external
manufacturers/services who are found
by project teams and used for early
development. Although not the subject
of the long term relationships formed by
outsourcing & procurement, there is still
an emphasis on maintaining good
relationships with a small number of
tactical suppliers.
is part of
is part of
is part o
Source Types
is part of
Dedicated Capital
The high prices charged for candidate
drugs is suggestive of an undeveloped
market.
Insuffident external capacity
is associated with
Capacity
Top reason for using external sources is
capacity. Internal demand often
outstrips internal supply.
Capacity links with dedicated asset
specificity given the inability of the
markets to absorb the capacity utilised
by the large pharmaceuticals. CRO's
don't have infinite capacity.
There is an effort to ensure capacity is
fully utilised to best cover fixed costs.
This contrasts (contradicts) Goldratt's
Theory of Constraints. The advantage
of the matrix structure in development is
that personnel can potentially be moved
to far larger range of projects, making
capacity utilisation more easy.
External sources used to act as a buffer.
Note the lack of "either-or" nature
assumed in many TCE studies.
In production there seems to be less
concern over using external sources as a
"top-up", rather in using external
sources to cover risks, that is spread
production among a number of sites
(internal & external) to cover risks.
Less notion of fully utilising capacity in
production?
is part of
Sourcing
There appear to be a numerous
comparable external sources, howev
outsourcing in R&D is seen as risky
(compared to production).
Yet lots of collaboration (universities
doctors?)
is associated with
Capability
Use outside sources for specialised but
not specific capabilities, e.g. statistical
information on drugs.
Most capability is in house. Rarely have
to go outside, e.g. catalysts. (90%
capability?)
Use outside sources to gain a foothold in
a new area.
India & China increasingly have the
capability, especially in production, but
also increasingly for clinical trails.
However fear over intellectual property
theft.
Considerable debate over the capability
that the company should maintain.
Takes time to build up a capability.
is part of
Risk
Monitoring Risk - The difficulty in
detecting if project work is running in
problems (exceptions occurring?)
Link between risk, temporal AS and
monitoring. TAS is the time invested
piece of project work. Monitoring is t
difficulty of determining if the piece o
project work is being being completed
correctly. The risk is created when th
time invested in significant and monit
is difficult. In particular the danger th
time will need to be reinvested in anot
source.
Changing Requirement - If requireme
change, difficult to recontract
(contractual obligation risk?)
Intellectual property theft risk
What is the concern over intellectual
property right theft in production? Le
than in R&D?
Buffer - The use of external sources t
take-up demand fluctuations
Not easy to use CRO's to cover dema
fluctuations
Use of external sources to cover
demand fluctuations appears to depe
on the size of the external market: la
enough in production, but not in R&D
Passion?
Universities seen as low risk
Overall, using external sources appe
to be perceived as more risky in R&D
than production

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