

OVERVIEW OF CASE STUDIES

C. Edquist, L. Hommen and L. Tsipouri

INTRODUCTION

Part II of this volume, because of both its size (by far the greatest part of this book) and the central importance to our work of empirical evidence, merits its own introduction. We provide this in the form of the present Overview of Case Studies.

The Overview first discusses (in part 1) the rationale for our selection of cases. Subsequently (in part 2), it addresses questions concerning generalisation from cases. Finally (in part 3), it presents a synopsis of the case studies. After stressing the importance of differentiating between 'developmental' and 'adaptive' public technology procurement, this part of the discussion presents summaries of two groups of case studies.

The final part of this Overview is also its most extensive. Our two groups of case studies – three from Sweden and six on telecommunications – represent 'national' and 'sectoral' contexts respectively. Each case is briefly summarised here. The summaries all highlight one or another aspect of the distinction between 'developmental' and 'adaptive' public technology procurement. This key distinction also figures importantly in our later discussions, in Part III, of Conclusions (Chapter 11, part 4) and Policy Implications (Chapter 12).

1. SELECTION OF CASES

The case studies that we present in this part (Part II) of the volume are cases of innovative public technology procurement carried out in response to perceived societal needs, combined with perceived requirements for 'demand side' intervention by public agencies responsible for meeting these needs. These cases occurred in a number of countries that are now EU member states. Namely, these countries are: Austria, Finland, France, Greece, Italy and Sweden.

Three cases are drawn exclusively from Sweden and concern the development of different technologies at different times: the procurement by Swedish public agencies of high speed trains and school computers in the 1980s, and of high voltage, direct current (HVDC) transmission systems in the middle decades of this century. An ad-

ditional six of our case studies represent all of the countries mentioned above and concern the development of digital switching systems (as well as Finnish and Swedish mobile telephony) in the telecommunications sector during the later decades of the post-war period.

As this list shows, all of our cases deal with large-scale (i.e., national – level) public sector infrastructural projects.¹ A possible exception to this rule is the case of "The Computer in the School". From a systems of innovation perspective, however, school computers can be regarded as a technical component of the 'knowledge infrastructure'. This term, according to Smith's (1997) definition, refers to "a complex of private and public organisations whose role is the production, maintenance, distribution, management, and protection of knowledge", and which possesses "technical and economic characteristics that are not dissimilar to those of physical infrastructure" (Smith, 1997: 94 - 95).

The theoretical discussion in Chapter 1 provides a basic rationale for this type of case selection. It points out that effective technology procurement depends on a high concentration of buying power and a comprehensive 'articulation of demand'. These conditions often tend to occur in conjunction with certain 'natural monopolies' – which have all, or nearly all, been publicly controlled in most countries (see Chapter 1, subsection 3.2.1). Sectors of this kind are, of course, precisely those in which specifically *public* technology procurement has played an important role in the past and can be expected to do so in the future. According to existing theory and research, this is especially likely to be the case with the development of new technology in certain contexts. Specifically, these are in large scale projects characterised by high levels of cost and risk, long term schedules, indivisibility, and structural effects on the productive system (ibid., subsection 4.2.1). Our cases of public technology procurement conform to these criteria.

Another criterion met by the selection of cases is the representation of both 'developmental public technology procurement' and 'adaptive public technology procurement' – terms defined briefly in our Introduction and explained more fully in Chapter 1 (section 2.2). As shown in the following synopsis of case studies (part 3 of this Overview), many of our cases concern developmental public technology procurement. However, some deal with cases of adaptive public technology procurement. In most there is a mix of 'developmental public technology procurement' and 'adaptive public technology procurement' elements. Thus, our selection of cases indicates a broad scope for public technology procurement policies.

As mentioned in our Introduction, the selection of cases also includes instances of both "success" and "failure". However, it is important to note in this connection that "success" and "failure" were not determined according to a uniform standard applied to all cases. Although we contemplated this strategy, we rejected it because a common

¹ A widely accepted definition of 'infrastructure' refers to "structural elements of an economy which facilitate the flow of goods and services", such as "communications, and transport ... housing, sewerage, power systems, etc.". It recognises that such facilities "are usually, though not necessarily, provided by public authorities and may be regarded as a prerequisite for economic growth in an economy" (Pearce, 1986: 204).

definition of 'success' could not be arrived at. In the absence of a common definition (of success), we judged each case to be a success or failure 'on its own terms'. That is, every case of a public technology procurement process was considered in relation to the particular objectives that were established for it. The evaluative question asked was, 'did the procurement process fail to realise its self-declared objectives or not?'. On this basis, it became possible to recognise comparable cases of failure and success without imposing a normative standard on any of the cases.²

Finally, as already mentioned, the selection of cases also covers several different countries. This group includes both larger and smaller national economies (e.g., France vs. Finland) and more-developed and less-developed ones (e.g., Sweden vs. Greece). It also encompasses a wide variety of institutional settings. Thus, common themes, conclusions and implications emerging from the analysis of the case studies can be expected to be applicable across a similar diversity among member states within the European Union as a whole.

2. GENERALISATION FROM CASE STUDIES

Case study research and analysis is commonly confronted with objections to its limited capacity for "generalisation". Such objections are, more often than not, based on a misunderstanding of case study methods, combined with a view of "generalisations ... as an end in themselves" that is tied to "a conception of social science as the search for order and regularity" (Sayer, 1992: 100). In other words, what is often (wrongly) demanded are *statistical* generalisations. These are statements of frequency with respect to relationships among variables occurring within a 'representative sample' that can be readily generalised to a larger 'population' or 'universe'.

Case studies are not, however, properly intended to make statistical generalisations. Rather, case studies produce *analytical* generalisation, in which "the investigator is trying to generalise a particular set of results to some broader theory" (Yin, 1994: 36). Thus, the object of case study research is not to select 'representative' cases from which it will be possible to generalise directly to a wide universe of other cases. Instead, cases are selected for the purpose of generalising findings to 'theory', after testing to determine whether the results of initial cases can also be found to occur in comparable cases. This use of *replication logic*, as it applies to our analysis, will be further discussed in Chapter 11 (in Part III of this book).

Case study procedures involving further analysis based on structured comparisons among similar cases are particularly well suited for the development of 'typological' theory. Such theory is not generated solely by means of induction. Rather, it proceeds from the empirical 'grounding' or particularisation of general explanatory theories in

² In comparative policy studies, such use of "context" to compensate for the absence of "rules" for making comparisons is particularly appropriate where "situations may be so different that existing behavioural methods do not apply, but at the same time there may be striking similarities and differences of behaviour that we want to examine systematically" (Ashford, 1992: 13).

analytically relevant cases. This leads to a clearer specification of "typical patterns and ranges of variation" (Diesing, 1971: 195 - 196). What results from this analytical-inductive approach to theory development is thus "rich, differentiated theory", which is cast in the form of contingent generalisations.³ Thereby, it possesses a capability for more discerning explanations than those offered by formal deductivist theories. Moreover, this kind of theory "also has far greater practical value for policy-makers, because it enables them to make more discriminating diagnoses of emerging situations" (George, 1979: 59).

The generalisations from the case study analysis that we present in Part III of this book are thus intended to further theory and policy developed from a Systems of Innovation perspective. The general theoretical perspective 'grounded' in the cases is outlined in considerable detail in Chapter 1 (Part I of this book). The particular themes or dimensions drawn from that perspective for the systematic comparison of public technology procurement across cases are subsequently identified and explained in Chapter 11 (in Part III of this book).

The general 'type' of case that we consider here concerns a recent process of public technology procurement taking the form of a large-scale project in public infrastructure development. It also deals with a procurement process occurring within a country that is now an EU member state. The 'contingencies' addressed are identified in the case studies themselves and further discussed in Chapter 11 (Part III of this book), which analyses and presents our main findings and conclusions from the case studies.

3. SYNOPSIS OF THE CASES

As mentioned above, our cases fall into two main groups. First, there are three cases drawn exclusively from the country of Sweden. Taken together, they provide varied perspectives on the process of public technology procurement within one 'national' system of innovation. These studies provide a basis for sectoral comparisons within a national context. The second group of case studies deals exclusively with the telecommunications sector but documents public technology procurement in a number of different countries. The telecommunications case studies thus make possible national comparisons within a common sectoral context. We summarise the two groups of cases below, in sections 3.2 and 3.3 of this chapter, respectively.

Prior to presenting the summaries, we draw attention to a further important distinction that can be made among the cases. This is the differentiation that we have made, conceptually, between developmental public technology procurement and adaptive public technology procurement. (These terms are defined both in our Introduction [part

³ 'Contingent generalisations' indicate how general rules, or propositions, are modified by different kinds or 'types' of circumstance, as in the following illustration: "Contrast, for example, a general explanatory theory such as 'war is the result of miscalculation' with a richer, more differentiated theory comprised of contingent generalisations that identify the different conditions under which different types of miscalculations lead to different types of war outbreaks" (George, 1979: 59).

2] and in Chapter 1 [section 2.2].) As indicated in our later discussion of Policy Implications (Chapter 12 in Part III of this book), the distinction between these two types of public technology procurement proves to be a significant basis for comparison. It assumes great practical importance in relation to key differences in 'systems of innovation' such as, for example, their relative degree of 'maturity'.

3.1 'Adaptive' versus 'Developmental' Public Technology Procurement

The evidence and analysis presented in the several case studies of public technology procurement in telecommunications and other sectors show that including both 'development-oriented' (developmental public technology procurement) and 'adaptation-oriented' (adaptive public technology procurement) cases is rewarding. They also point to analytic and empirical problems involved in constructing and maintaining a rigid distinction between developmental public technology procurement and adaptive public technology procurement.

Many of the cases address adaptation- rather than development-oriented procurement. In particular, the Austrian and Greek cases deal with clear instances of 'adaptive' public technology procurement. The French and Italian cases deal with processes involving elements of both development-oriented and adaptation-oriented public technology procurement – the former predominating in the French case, the latter in the Italian. The Nordic cases are also mixed, though they deal primarily with 'developmental' technology procurements in various sectors. The following summaries consider the balance between 'development' and 'adaptation' in the various studies.

3.2 Swedish Cases

The Swedish X2000, a tilting high speed train, is discussed as an adaptive public technology procurement case. The design was, in some respects, unique and it incorporated some major innovative components, with a potential to generate new dominant designs, but it lost out in an international technology competition. The project would have been a case much closer to developmental public technology procurement than adaptive public technology procurement, had it been implemented as early as originally envisaged by the Swedish railway industry in 1969. But the very long time elapsed between this vision and the first deliveries turned it into a more conventional project from the point of view of technological change.

Overall the X2000 project was a moderate success: It succeeded in technical terms and industrial delivery, and fulfilled its role in increasing the competence of the supplier, ASEA (later ABB-ADtranz, and now ADtranz). Nevertheless, it failed to create a strong Swedish presence in the international high speed train market. The case study demonstrates the importance of time in turning a potential developmental public technology procurement into adaptive public technology procurement. It also shows that within adaptive public technology procurement there are different grades of advance

of knowledge, since the X2000 had a more innovative character than the typical adaptive public technology procurement telecommunication cases in Austria and Greece.

The procurement of High Voltage Direct Current (HVDC) transmission technology in Sweden belongs to the most successful cases studied and constitutes an ideal developmental public technology procurement with follow-ups leading into a broad sectoral and geographical technology transfer. This makes it a case with additional adaptive public technology procurement elements over and above the initial developmental public technology procurement success. Over a very long period of time, 'adaptive' technology procurement both preceded and followed the 'developmental' procurement of HVDC.

After a long proto-procurement phase between 1919 and 1939, the actual technology procurement phase began in 1940 and the first procurement contract was signed in 1949. The decision for the final construction was taken in 1953 and the first part of the transmission started in 1954. Ultimately, it wasn't until 1961 that the HVDC technology matured and took its first steps in the European and international market. Developmental public technology procurement was justified by the need for two major technological solutions. After long experimentation during the 1940s, the producer, ASEA, could face both critical problems and combine them into a reasonable HVDC transmission for the first time.

The adaptive public technology procurement that followed was related to demands of the user (a public utility) for reduction of cost, improved efficiency and better regulation. The HVDC case being both developmental public technology procurement and adaptive public technology procurement suggests in its description that a successful developmental public technology procurement is often followed by possibilities for adaptive public technology procurement. Derived benefits were high for both the supplier, who gained an international reputation and major follow-up and export contracts from the 1950s onwards, and the procurer, who initiated at the same time a period of lower transmission cost that outweighed by far the initial budget increase. The supplier, in particular, had a practical monopoly on HVDC technology world-wide and could apply profit margins up to 20% until 1970.

The Compis project, aimed at developing a Swedish school computer, is another case of a development-oriented project and therefore a developmental public technology procurement. At the time the project was conceived, i.e., 1981, the personal computer for use in schools did not exist in the Swedish market and, with the specifications suggested, it did not exist in the international market either. Additional and new technology development was necessary so it really constituted an ideal type of developmental public technology procurement.

Time was also a crucial factor in the Compis project. The relative maturity of the basic technology and the existence of parallel design efforts by US producers, notably Apple, meant that the project was associated with a high level of uncertainty and a strong need to anticipate correct technical solutions, entering the market not only early enough but also with the right standards. In the end, Compis failed to realise its potential, due to problems with the selection of technical standards and problems of co-ordination and decision making that led to late delivery and premature discontinuation of the product.

3.3 Telecommunications Cases

There is a clear focus on developmental public technology procurement in the Swedish telecommunications study, but this is set in the context of a much longer history of 'switching relations' dominated by adaptive public technology procurement. Over a period spanning the greater part of this century, recurrent collaboration in the context of public technology procurement formed a 'Development Pair' between the public utility, STA (the Swedish Telecommunications Administration), and its main supplier, LME (the L.M. Ericsson company, later renamed Ericsson). In the formation of this Development Pair, therefore, 'adaptive' technology procurements of an incremental character and informal collaboration laid foundations for more formal 'developmental' procurement. Similarly, the Finnish study demonstrates that the analyst's selection of the period of time to be used as a frame of reference for the study of a particular instance of public technology procurement influences whether the procurement should be viewed as adaptive public technology procurement or developmental public technology procurement.

The French and Italian cases deal with processes of public technology procurement occurring over very long periods of time. They stress not the objective, but the subjective, aspect of time: how the possession of a short-term or long-term strategic perspective, or 'vision', on the procurer's part can decisively affect whether a series of related technology procurements will turn out to have a primarily 'adaptive' or 'creative' character. Both France and Italy set out to develop unique 'national' digital switching systems. Though France had a much earlier start than Italy, Italy's CSELT was in fact able to keep pace with the French CNET's development of the time-division switching technology. Yet Italy lagged far behind France in the modernisation of its telecommunications network during the 70s and early 80s. Moreover, the later development of the Italian system was based to a remarkable extent on the adaptation and diffusion of knowledge and expertise acquired from external sources. In France, however, the result was clearly a 'developmental' technology procurement, involving a much stronger development of original 'national' competence. This was due to the fact that France, unlike Italy, began with (and adhered to) a long term perspective or 'vision' of ending the domination of its domestic telecommunications sector by foreign subsidiaries and replacing them with a 'national champion' capable of competing on international markets with a superior technology.

The Greek and Austrian cases follow the pattern of the Italian one, at least insofar as they are narratives about 'catching up', rather than 'forging ahead'. However, they also point out in different ways that a lack of 'vision' is not the sole factor of explanation in accounting for failures to realise the full developmental potential of public technology procurement. Both of these public technology procurement processes were, from the outset, conceived of as 'adaptive' projects. However, they were also motivated by the desire to provide opportunities for 'development' rather than restricting their aspirations to 'adaptation' only.

The Austrian case study describes, for the most part, a 'success story' but a failure "to foster exports". This failure is attributed, primarily, to the over-riding conception

of the Austrian public technology procurement process as 'export policy', rather than 'technology policy', witnessed by the failure to co-ordinate the procurement with other policy instruments. The Greek study deals with a case in which there was a better fit and co-ordination of policies, particularly in the design of the procurement mechanism. Yet, at the same time, the Greek case was also one in which long delays in the implementation turned the switches into a standard product procurement and the buyer lost every advantage in terms of timing. The delays are attributed to discontinuity and friction between formal and informal institutions, which stalled the agencies responsible for implementing the procurement.

The conflict between formal and informal institutions referred to in the Greek case was based on the desire of the administration responsible for implementing the procurement to avoid public controversy and notoriety. Thus, official public technology procurement initiatives and the formal rules and procedures for conducting them were stymied by Greece's informal rules for public procurement. These consisted of procedures for delaying or avoiding non-unanimous decisions in order to avoid publicity and thereby safeguard the integrity and public image of civil servants. In contrast, no such pronounced conflict between formal and informal institutions, but rather a complementarity between them, was evident in the Austrian case.

REFERENCES

- Ashford, D. E. (1992). Introduction: Of cases and contexts. In D. E. Ashford (Ed.), *History and context in comparative public policy* (pp. 3 - 23). London: University of Pittsburgh Press.
- Diesing, P. (1971). *Patterns of discovery in the social sciences*. Chicago and New York: Aldine-Atherton.
- George, A. L. (1979). Case studies and theory development: The method of structured, focused comparison. In P. G. Lauren (Ed.), *Diplomacy: New approaches in history, theory and policy* (pp. 43 - 68). New York: The Free Press.
- Pearce, D. W. (Ed.). (1986). *The MIT dictionary of modern economics*. Cambridge, Massachusetts: MIT Press.
- Sayer, A. (1992). *Method in social science: A realist approach*. (2nd ed.). London: Routledge.
- Smith, K. (1997). Economic infrastructures and innovation systems. In C. Edquist (Ed.), *Systems of innovation: Technologies, organizations and institutions* (pp. 86 - 106). London: Pinter Publishers/Casell Academic.
- Yin, R. K. (1994). *Case study research: Design and methods*. (2nd ed.). London: Sage.