Designing Markets in Infrastructures: from Blueprint to Learning

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DESIGNING MARKETS IN INFRASTRUCTURES: FROM BLUEPRINT TO LEARNING

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1. Introduction

In 1994 the Dutch government presented the plans for the construction of the High Speed Line (HSL-South) between Amsterdam and the Belgium border to realize a fast train connection with Paris. In 1996 the decision was taken to construct a new track and a tunnel of nine kilometers under the so-called 'Green Heart' of the Randstad area. The infrastructure is technologically, politically and economically a very complex issue. It was decided to govern the transactions as much as possible through public-private partnerships. The inefficient coordination in 'public government bureaus' was to be replaced by efficient contracting. Involving private, profit-oriented firms as much as possible into the project would secure proper risk calculations, proper cost-benefit analysis, and would force government to define the project in precise terms. Including private actors would also make the demands for clear accounting rules and clear responsibilities very strong. That government should be at distance was expressed in relatively new type of contracts; D&C (Design and Construct) and DCFM (Design, Construct, Finance and Maintain) contracts would allow private parties maximum room to manoeuvre. Government would tender the project and the bidder with the best proposal would get the contract. The private actors would then use all opportunities to propose in their biddings integrated low cost solutions and innovative combinations. Because government should specify from the beginning onwards the 'requirements' clearly, would negotiate for well defined and feasible contracts and would adequately monitor the performance of the private contractors, this design of the market would serve both private and public interest. All this under the assumption of healthy competition.

Because of the large budget overruns and all kind of inefficiencies, the Dutch Parliamentary Investigation Committee on Infrastructural Projects (the Duyvensteijn Committee) reported in December 2004 about the investigation of three large infrastructure projects among which the HSL-South. The research of the committee was led by a group of colleagues of the faculty Technology, Policy and Management of the Technical University Delft. Hugo Priemus chaired the research group and he concluded recently about the HSL-South that so many things went so terribly wrong in the design of the market, in organizing the competition and in specifying the transactions in the contracts, that 'Murphy's law' is applicable to the HLS case (Priemus, 2005; see also Koppenjan and Leijten, 2005).

1 Many thanks to Rolf Künneke for his comments on an earlier draft
The analysis in the reports of the 'Duyvensteijn committee' showed an almost complete failure of the public-private partnership (PPP) in the HSL case. Only the construction of the tunnel is considered technologically and institutionally a successful design. The other PPPs were a failure.

First, there were large budget overruns. The total project was budgeted at 2.7 billion Euros in 1994, in 1996 it was 3.4 billion and at the moment around 6.8 billion. What will be the outcome in 2007 when the project is concluded?

Second: the tender procedures for the contracts resulted in a cost reducing and innovative contract for the tunnel under the Green Heart, but all other contracts were a failure. The total costs based on the offers in the contracts exceeded the budget by 43%. It turned out that the budget calculated by the Ministry was systematically too low, whereas the offers of the firms did not lead to substantial cost reductions and innovations.

The introduction of 'more market' into the construction of an infrastructure like the HSL-South clearly did not result in the efficient performance policy makers and the designers of the market had hoped for. What went wrong?

2. A multi-disciplinary, multi-level and multi-actor system

Why the introduction of markets and contracts in the case of the HSL-South was not successful cannot be easily answered, because from the facts mentioned above it seems we are dealing with at least three interrelated domains at different levels (figure 1).

The domain of technology refers to the technological paradigm (trajectory or technological regime) being the basic understanding of how to engineer the physical environment, followed by the level of technical artefacts of physical networks (pipes, tracks and wires). The operationalisation of the system is located at the lowest level of the technological domain.

The domain of economics refers to the production of goods and services starting with the macro-level of aggregates like the Gross National Product, followed by the production at the meso-level of regions and industries (with the degree of competition as important element). The micro level of the production unit (economies of scale and scope) is located at the lowest level of the domain of economics.

The domain of institutions refers to informal institutions of values, norms and attitudes, the formal institutions of laws and regulations and the level of the institutional arrangements, like contracts and organizations. This is the domain of the coordination of transactions. It is the domain of designing markets, where contracts and organizations coordinate economic transactions.

Figure 1 also shows the different actors involved. From the HSL case we learn that government at different levels is an important actor next to the firms, consortia of firms, the public-private partnerships and the non-governmental interest groups.

To sum up: in cases like the HSL-South we deal with a multi-disciplinary, multi-level and multi-actor system.
3. The static economic perspective on markets

The chair 'Economics of Infrastructures' focuses on the domain of infrastructures like the HSL-South using the economic perspective. That is to say: not all the domains, not all the levels and not all the actors are included into the analysis. The economic perspective concentrates on specific aspects leaving other aspects to other disciplines, like political science, sociology, physics, etc. What would be the contribution of economics to the understanding and explanation of the case of the HSL-South? What has economics to report on the issue of designing markets in the construction of the HSL-South?

All infrastructures have experienced fundamental changes the last three decades due to technological developments, changes in policy of governments and developments in economic insights. An important driver behind the change in infrastructures is the belief that more market, more competition and less government lead to higher efficiencies: the infrastructure services will be offered to consumers at lower prices and the production processes, as well as the products, will be more innovative due to the pressure of competition.

A larger role for markets implies that public bureaucratic organization is replaced by private market contracts. Contracts are economic institutional arrangements that can coordinate transactions between individuals, firms and public organizations efficiently. Actors will negotiate on contracts in an attempt to maximize their profits and utilities, or minimize their costs. However, such a bargaining process becomes costly the more complex the transactions are. A complexity that has to do with the technology involved, the level of uncertainty, the information available to all or a few parties, the power relations, the transparency of the legal rules of the game, etc.

The central message from an economic perspective is that market contracts can indeed coordinate transactions effectively and efficiently, but that conditions of uncertainty and complexity can become such that contracts need 'additional governance', need 'assistance' of other types of institutions in order to get the coordination done efficiently (Williamson, 1996a). When transactions become complicated economic theory provides ideas that contracts can then be best assisted by specific institutions like arbitrage committees that settle disputes, research bureaus that provide additional information to all actors, strategic alliances that provide additional coordination, etc. Markets are then said to be privately ordered because private actors like firms and consumers take the initiative. On top of that economic theory explains that also public ordering is warranted: public-private partnerships and regulatory agents that monitor behavior and have the right to intervene on behalf of government then assist the market in realizing public objectives in an efficient way.

Efficient 'double organized markets' (Groenewegen, 1994) do not come about automatically, but need careful design. The design of the institutional arrangements like D&C contracts is specifically complicated in infrastructures because of the interrelations between the technological, the economic and the institutional domain.

In the following we will discuss some issues related to the design of markets in infrastructures first from the static economic perspective followed by the dynamic one. I will illustrate the economic perspective with the HSL-South case and focus on the part of the D&C contracts of the foundation structure of the track.

3.1 The static blueprint design

Economics is about efficiency: in the domain of the economics of production it is about the minimalization of production costs, in the domain of institutions it is about the minimalization of transaction costs. From the economic perspective well designed competitive markets are believed to produce goods and services in such a way that resources are used efficiently (technical productive efficiency), that preferences of consumers are satisfied (allocative efficiency) and that production processes and products are innovated (dynamic efficiency). Standard mainstream neoclassical economics (NCE) shows how equilibrium prices in markets inform actors about efficient allocation of resources. This would be the domain of the economics of production. Since the mid-1970s another school of economic thought has appeared on stage: the so-called New Institutional Economics (NIE), which focuses on issues of efficient coordination of transactions: this is the domain of institutions. Also here efficiency is central: how can economic transactions be coordinated in the most efficient way, i.e. with the lowest transaction cost possible (Groenewegen 2000)?

Institutions guide behaviour on the one hand and are instruments of actors on the other. In Figure 2 three categories of institutions are depicted: at level 1 the informal institutions of values, norms, attitudes: the level of culture. At level 2 we find the formal institutions of laws and regulations, as well as the public and political institutions like bureaucracies, political parties, ministries and parliament. At level 3 the
institutions arrangements are located: contracts and private organisations, like firms, that coordinate economic transactions. At level 4 we position the individuals that are members of families, private and public organisations and larger national and international communities. Figure 2 is based on the three and four layer models of Williamson (1996 and 1998).

Figure 2; A four layer model of institutions: static view

- Bounded rationality
- Opportunism
- Cost minimizing behavior

NIE aims at explaining institutional arrangements (often called ‘governance structures’) at level 3 given the (in) formal institutions, given the technology and given the preferences of individuals. The individual agents are modelled as cost minimising actors that have no other option than apply the most efficient solutions because otherwise they will not survive the selection process of competition. NIE is not any differently constructed than NCE: all three elements of NIE conceptualise the change in property rights, principal-agent contracts or governance structures as the result of maximising or minimising behaviour of individual agents, who have sufficient information to calculate ex ante the optimal combinations, or it is assumed that ex post the optimal alignment between transactions and governance structures will emerge. Preferences are exogenous and outcomes of selection processes are equilibriums. Explanations are in terms of causes (individual actions and selection mechanisms) and consequences (efficiencies).

The relation between the layers in Figure 2 is one of the higher levels constraining the lower ones: the informal institutions constrain the formal ones, which set boundaries for institutional arrangements. Note that no feedbacks are analysed and that individuals are isolated from institutional structures. Note also that the domain of technology is no part of the analysis. This is the static economic perspective.

In the HSL case there is a number of transactions that need coordination: transactions of capital (the project has to be financed), of intermediate goods (suppliers produce goods and services for main contractors), as well as labour (firms and government hire labour), all need coordination. Coordination does not come for free: costs of searching the right partners, of getting sufficient information, of drafting a contract, of negotiation, of monitoring, and of settling disputes, are all elements of the transaction costs involved.

In the case of the HSL-South the contracting parties had to be selected, the contract conditions (‘functional requirements’) had to be communicated, organisational structures of arbitration had to be agreed upon, etc. NIE provides insights into efficient incentive structures (issues of property rights), safeguards against opportunism (principal-agent relations) and costs of coordination (governance structures that reduce transaction costs). The question which NIE is able to answer is: given the technology, given the values (layer 1), given the legal structures (layer 2), and given

Source: adapted from Williamson (1996b, chapter 13 and 1998)

\(^2\) We consider the property rights theory, the agency theory and the transaction costs economics as the three pillars of NIE (see Groenewegen, 2000 for a more extensive discussion on institutional economics).
preferences of actors (layer 4), what then is the cost minimizing governance structure (layer 3)? These optimal governance structures are presented as blueprints: normative designs of how transactions should be coordinated.\(^3\)

**The design issue**

With respect to the design issue, NIE claims that when the private property rights are well defined, public courts settle disputes over contracts efficiently and more, the rules of the (competition) game are 'right' and monitoring of competition is 'right', then the market is designed in such a way that spontaneous behaviour of the individual agents will produce optimal equilibria. So two design issues are at stake: one for government at layer 2 and one for market actors at layer 3.

Government is responsible for the design of the legal environment of property rights and corporate and competition laws; economic actors are responsible for the design of institutional arrangements, like contracts and organisations to coordinate their transactions efficiently.\(^4\) New institutional economics provides guidelines for both types of market design. Important concepts of NIE refer to the characteristics of transactions like uncertainty and asset specificity on the one hand and to capabilities of different governance structures to cope with the transactional issues sufficiently on the other. Level 3 in figure 2 refers to those governance structures like contracts and organisations. In the case of D&C contracting technological and political uncertainties play an important role. Contracts then have to be made conditional and cannot be specified in detail. When also specific costly investments have to be made by the firms, a situation might occur in which during the execution of the contract parties are locked-in, blocking a way back. Actors are then more or less condemned to each other. In that kind of 'hold ups', contracting costs can raise substantially and during the process the power balance between the actors can change substantially.

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\(^3\) When competition does the assumed selection job, NIE is also a positive theory.

\(^4\) As will be discussed below government can also act on layer 3 in the role of economic actor; see public-private partnerships

**A Contracting Scheme for Infrastructures: blueprints**

We focus on layer 3 of figure 2: the institutional arrangements. The institutional arrangements ('governance structures') considered relevant for infrastructures are shown in figure 3.

On the vertical axe the degree of complexity of the transaction is indicated from low to high and on the horizontal axe the type of governance structure is shown. High complexity refers to transactions for which actors make specific investments in equipment or labor (so-called high asset specificity). The investments of a construction firm in specific drilling equipment adapted to a very specific type of soil, would be an example. This high asset specificity makes parties vulnerable to opportunism of the other actors and demand for private and /or public ordering to cope with potential 'hold ups'. The complexity in relation to the coordination of transactions is also related to the degree of uncertainty (see level 1 and 2 of figure 2) and the number of actors with different objectives (see figure 1). So asset specificity, uncertainty and number and type of actors determine the degree of complexity.

With respect to the governance structure on the horizontal axe, the situation on the left represents the spot market, which becomes more privately ordered when moving to the right. Via public-private partnership and different degrees of regulation the extreme is the public bureau being a state owned and state operated structure.

Node A represents the situation of classical contracting. It is the situation where private actors own the assets and operate them. They bargain on spot markets and coordinate transactions in so-called classical contracts that specify all rights and obligations neatly. It is a situation in which actors experience the full blown pressure of market competition: so-called 'high-powered market incentives' dominate. The transaction can be efficiently arranged in that way because complexity and uncertainty are relatively low, as well as the asset specific investments. So the danger of opportunistic behavior and hold up situations is minimal. In case it occurs public courts can efficiently solve disputes based on the contracts. The design of this market concerns only a clear formal set of rules at level 2.

Node B represents the situation in which investments are more specific, the duration of the relationship matters and hold ups should be foreseen. Then actors in markets are in need of institutional arrangements that provide 'credible commitments and safeguards'. The contracting becomes more 'relational'. Next to the public courts also
private courts are created to settle dispute (arbitrage committees). We are in the world of private ordering

Node C is a step further down the ladder of private ordering towards hierarchical governance. Now administration instead of the spontaneous market coordinates the transaction. Well known examples are found in vertical integration, a step which will be taken when assets are very specific, uncertainty is relatively high and the transaction is of strategic importance. (Ménard, 1996, differentiates between different hierarchies).

Figure 3; Static Blueprints of private-public ordering

With node D we enter the domain of public ordering: state ownership or government regulation is then central. In node D private firms own and operate the network infrastructure. In order to safeguard the public interest a governmental agency regulates the industry, a regulation of which in a liberalized market the entry of competitors in the network is a central issue. In this case the network and the operators are 'administratively unbundled'. NIE provides valuable insights with respect to the transaction costs of regulation. The contractual relationship between the regulator and the firm will be designed differently depending on the nature of the transaction (Ricketts 2002, 510). The lens of formal agency theory would perceive a principal and an agent and formulate the problem in terms of an optimal contract with incentives and risk as central items: what are the costs of monitoring the efforts of the agent, what is the degree of risk aversion of the actors, what is the environmental uncertainty and what would be the 'efficiency' of the efforts of the agent to influence the outcome? The lens of Transaction Cost Economics (TCE) would perceive a governance structure between the regulator and the firm to deal with opportunism. Next to the agency issues mentioned above, TCE would look at the frequency and duration of the transaction (reputation and trust), as well as asset specificity and resulting hold up situations.

The contract between the regulator and the private firms would be about rates of return and prices to charge for the use of the network by competing firms. Research shows that the regulation costs are high when the firm owns and operates the network and at the same time has to open up the network to competitors at reasonable prices.

In node E ownership and operation is separated ('legal unbundling'): the network is leased to a separate company so the owner is not tempted to provide special advantages to its own operator. This would relieve the task of the regulator (Ricketts, 2002).

Node F represents the case in which the state owns the network and a franchisee operates the network. New institutional economics has pointed out that franchise bidding is problematic when large amounts of durable and sunk capital are at stake under uncertain dynamic conditions. Capital valuation problems and regulatory hold up are issues then arising (Ricketts, 2002: 527).

In node G government owns and operates. This is the extreme case of the so-called 'public bureau' (Williamson, 1998). The public interest prevails, consumers get services delivered at marginal costs. The disadvantage of low powered incentives and relatively
high bureaucratic costs (X-inefficiencies) are the right choice in situations of a lack of competition, little opportunities to innovate, no pressure from a loss of reputation, and the like. In short: when competition would not be possible anyway then a well-organised bureaucracy can be more efficient then a private monopoly.

Public-private partnership; D&C contracts

In many large infrastructure projects the arrangement in which the state owns and operates has been abandoned (bureaucratic inefficiencies) and is replaced by arrangements in which private actors play a more or less prominent role. Traditionally either government controlled the design and construction of infrastructures internally in a bureaucratic hierarchy, or government made such specific technical designs that the contracting firm had no other option than precisely execute the contract. Budget steering was central. The modern arrangements between government and private actors moved away from bureaucratic dominance to more market. In terms of figure 3 the governance structure moved from top right to the left, but not completely to the extreme of the spot market. A more or less pure market with classical contracts is not considered efficient due to the specificities of infrastructure projects like the strongly increasing returns to scale, high levels of capital intensity, deployment of long-lasting industrial assets, and the vital importance to the economy (see Wubben and Hulsink, 2003). An arrangement considered effective and efficient nowadays is somewhere in between the bureaucratic agency and the pure market often called Public Private Partnerships (PPP), being forms of cooperation between public authorities and the world of business, which aim to ensure that infrastructure projects can be carried out or that services of use to the public can be provided. The cooperation is concluded in contracts between government and the private firm(s) that coordinate the transactions between them. As discussed above in most cases government (often a ministry) organizes a tender for the contract(s) of the project and concludes contracts with the firm that makes the best offer.

In the case of the HSL-South government opted for so-called D&C contracts to offer firms the possibility to economize by integrating the design and the construction and to stimulate firms to make innovative offers that would not have been possible under the old regime of contracting. What are the design requirements for an effective and efficient D&C contract? Our NIE perspective provides the following insights (see also Priemus 2005 and Koppenjan and Leijten 2005):

1. When government organizes a 'beauty contest' to select the firm with the best proposal, it is a prerequisite that government provides a list of requirements that clearly sets the constraints and objectives for firms. The list should provide ample room for firms to design and construct in such a way that new integrated solutions and innovative cross-border combinations can be made.

2. A competitive market structure should be present so the participating firms experience the high powered market incentives. In the case of the HSL-South the entry of foreign firms is important, as well as the absence of collusion among Dutch firms. The prediction of the demand side should not show a situation of excess demand, because that would eliminate the competitive pressure on firms.

3. Although in complex infrastructures as the HSL-South uncertainty is relatively high, the proposals of the firms should be as complete as possible. In the case of open ends and arising conflicts clear private and public procedures should be agreed upon.

4. To evaluate the proposals and to make a comparison, government should have the necessary expertise; this is the more true when government negotiates the contract with the selected firm(s).

5. The contract will necessarily be incomplete, but it should be designed in such a way that the conditions under which a specific scenario holds are clearly spelled out.

6. Monitoring of the execution of the contract should be accurate and effective.

4. A dynamic learning economic perspective

The process of the construction of the HSL-South did not result into the PPPs the markets designers aimed for. The process that developed especially in the period between September 1999 and July 2000 when the contracts were signed, destroyed the idea of a partnership completely: adversarial relationships between government and firms ended in a kind of trench-war. The contracts that were finally agreed upon were so complex that no one could evaluate the implications anymore. A risk analysis was conducted by Lloyds that concluded that large parts of the cost reductions offered by firms during the re-negotiations with government, were a fiction, that in the new offers quality was substantially reduced and that risk was shifted to government mainly because the penalty clause for contractors in case of late delivery was cancelled. Large uncertainties remained leading to the advice to create a budget for unforeseen expenses of 79 million Euros, which is completely inconsistent with the philosophy of D&C contracts. What went wrong during the process towards the realization of the
Institutional market design? This question cannot be answered with the static economic perspective.

In order to analyze the process that developed over time figure 4 shows the interrelationships between the layers; technology is now explicitly part of the theoretical framework.

Figure 4: A dynamic layer model of technological, socio-economic systems

The feedback arrows in figure 4 indicate the interaction between the layers. In the dynamic view the market is conceptualised as an evolving institution, not equilibrium is the characteristic but change and more specifically: cumulative change. The same holds for firms and contracts: these are first of all evolving institutions driven not only by efficiency seeking actors, but non-efficient power struggle can play a decisive role too (North, 1990). Moreover, the path of change is according to the dynamic view dependent on the choices made in the past and the present situation determines to a large extent the range of choices for the future. Here concepts of ‘path dependency’ and ‘cumulative causation’ are central. In the dynamic view the process of change is the central research question and not the equilibrium end state: process-orientation instead of equilibrium-orientation. The stream of thought in economics that offers valuable insights in issues of process analysis is the so-called Original Institutional Economics (OIE) (Groenewegen, 2000). In the process-oriented approach

"The economy is an open and evolving system, situated in a natural environment, affected by technological changes, and embedded in a broader set of social, cultural, political, and power relations." (Hodgson 2000, 2).

In the process-oriented approach the actors are no longer objective, homogenous agents with given preferences and identical rules of behaviour, but

"The institution in which he [the actor JG] finds himself is both the cause and the effect of his beliefs..............Common beliefs and desires are the vitalizing, active force within institutions" (Commons 1965, 6-8).

The causality in figure 4 is both downward and upward creating over time the values, norms, habits, formal institutions, institutional arrangements and mental maps of the actors and their power base (Bush and Tool, 2001). The driving forces, like technology and learning, cause changes in the institutional structures and in the longer run also in the habits and mental maps of actors. Institutions influence learning and selection processes in terms of initial conditions ('history matters'), lock-ins and trajectories. Different selection mechanisms may work simultaneously; efficiency and power work at the same time making predictions about outcomes extremely difficult. The dynamic models of private and public ordering do not present the future in terms of equilibria, of the blueprints we discussed above, but focus on the process itself.

Source: adapted from Koppenjan and Groenewegen (forthcoming)
4.1 The design issue.

With respect to the design of markets, the dynamic view has large implications for the role of competition and competition policy, for the type of institutional arrangements designed to facilitate learning.

**Competition**

In historical overviews of the conceptualisation in economic theory of competition is shown how the process-oriented approach of earlier concepts of competition was replaced by the equilibrium-oriented approach. The process-oriented approach was present in Adam Smith, the (neo-) Austrian school and especially in institutional economics as it emerged in the USA in the beginning of the 20th century (the so-called Original Institutional Economics: OIE). Static competition implies that new entrants come into the market with the same product as incumbent firms: the competition is about prices and every firm should produce at a scale that minimizes productions costs. The same holds for the minimalization of transaction costs: all firms should align the transactions with the same efficient governance structures otherwise their costs are higher then those of their competitors and they will not survive.

In a dynamic process-oriented perspective a completely different kind of competition is considered vital to survive. Firms should constantly look for new geographical markets, for new combinations of production factors, new products and services in order to distinguish themselves from their competitors. Next to prices competition focuses specifically on quality, service packages, brand loyalty, location of delivery, the period of delivery (long term contracts or spot market contracts), etc. (Bauer, 2003). These competitive strategies fit a dynamic world where the aim is to reduce uncertainty and the substitutability; innovation then is the key strategy. As discussed elsewhere innovation calls for long term commitments, for temporary monopolies and for contracts and organizational arrangements that reduce short term competitive price pressures.

Melody (2001) and others explain the importance of understanding competition as ‘effective competition’ meaning that a certain degree of competition is warranted that stimulates rivalry but also allows for long term innovative trajectories. Regulation and competition should maintain flexibility and disequilibrium in the interest of encouraging innovation and change (Trebing, 1997).

“Competition must be seen, not as a substitute for regulation, but as a valuable tool of regulation that in many circumstances can be the most effective vehicle for achieving both efficiency and social policy objectives” (Melody, 1999, 27).

In the dynamic institutional view policy objectives are central: government should explicitly formulate policy goals and should explicitly design the instruments to realize these goals. One of the most important instruments is that of effective competition. In the view of OIE markets and competition do not automatically produce the best outcomes for both private and public goals. On the contrary: private oligopolies and monopolies are likely to emerge also in infrastructures mainly through Mergers and Acquisitions to control the market in their own private interest. The dynamic institutional view advocates a strong government that protects the market against private control and that safeguards the ‘blessings of effective competition’.

**Institutional arrangements designed for learning**

In the static view information is first of all objectively provided by markets, it is available to all parties, or can be bought at an equilibrium price on the ‘market for information’. An information asymmetry continues to exist because it is too costly for the other to produce the same level of information. When actors receive information they can immediately apply it in the same efficient way as their competitors.

In the dynamic view the focus is on the process of institutional change in which all layers of figure 4 interact. In that process knowledge-building (tacit knowledge) and learning are central. Variety, trial and error and retention of what is learnt, have an impact on what is considered an efficient institutional arrangement, an efficient contract.

When conditions are such that technological, political and economic uncertainties dominate the scene, which makes blueprints about optimal end states less relevant, the design of markets and contracts should open opportunities to experiment and learn.

4.2 PPPs in the HLS case from a dynamic perspective

We discuss the HSL case according to figure 4
1. At layer 1 we position the values and technology.

At layer one of figure 4 the Dutch culture in the construction industry is one with a long history of strong private ordering: until the mid 1990s cartels were not forbidden (Groenewegen, 1994). On the contrary: government accommodated those private institutions. This history has had a strong impact on risk behavior of both firms and government and on the type of guiding principles government applies (low budgets and detailed specifications in the list of requirements, see below level 3). Although formally the rules at layer 2 forbid collusion among firms and also in the Netherlands the EU competition rules apply nowadays, the interpretation of the rules and the actual behavior is still embedded in a specific Dutch culture (Priemus, 2005). However, when at the same time the value of ‘privatization’ is pushed by government and it is decided to have transactions coordinated in PPPs and market contracts as much as possible, then a careful analysis of the (changing) Dutch culture and the impact on actor behavior should be part of the analysis.

Because of the high (ideological) value attached to PPPs and the high (political) value attached to the HSL-South project itself, all information in reports that showed profitability in the construction and operation were well received (to attract private firms) and all figures that showed a negative picture were ignored. Consequently a realistic evaluation of the costs and benefits of the project was missing as well as a realistic comparison of different governance structures to coordinate the transactions with construction firms. The HSL was to be constructed anyway like the coordination was to take place in PPPs and D&C contracts. That was a matter of (political) values.

With respect to the values in the world of the construction firms it turned out that the traditional attitude towards ‘the organization of the market’ to keep competitors out was still dominating. After the tender it turned out that for each of the contracts five consortia subscribed, but these consortia consisted each time of the same (Dutch) firms. Competition was absent with the contract for the tunnel as the exception (Priemus, 2005).

At level 1 we also locate the technology. With respect to the technological design it turned out that the firms were not really offered a situation to design in a more open, creative and innovative way. The ‘functional program of requirements’ and the ‘reference design’ were such that firms were very much constrained by the guidelines of the ministry as was the case in the ‘old’ type of contracting (see below at layer 3).

2. At layer 2 we position the formal rules of the game.

At level two government aimed at the design of an open, transparent market controlled by clear competition rules monitored by an independent regulator (the NMa). In the case of the HSL - South this would mean that a substantial number of firms would take part in the bidding for the contracts. A careful analysis of the market structure, the potential entry of (foreign) firms, and the situation on the demand side of the market is needed in order to assess the degree of competition. The analysis made in 1998 by Twynstra and Guilde projected a healthy competition, but it turned out that both the supply and demand side of the market developed differently. On the one hand neither small and medium sized firms nor foreign firms entered the market, whereas on the other hand government created an excess demand situation by starting more large-infrastructure project at the same time.

With respect to the formal rules and guidelines concerning the D&C contracting the case shows that government did not provide an adequate functional program of requirements and no adequate reference design. It turned out that government operated in the way traditional contracts were managed and provided guidelines for the firms that were much to detailed and constraining. Firms considered the contracts not as ‘Design and Construct’, but ‘Engineering and Construct’ (Priemus, 2005).

3. At layer 3 we position the institutional arrangements.

For the so-called foundational structure of the HSL tracks, D&C contracts were designed. In order to maximize the advantages of the D&C contracting one contract for the entire project would be optimal instead of 21 traditional separate contracts between the state and the firms (Koppenjan and Leijten, 2005). When one firm can propose an integrated contract about design and construction of the complete foundational structure, then the opportunity is created to economize on scale and scope and to propose innovative solutions that cross traditional barriers. When one firm coordinates the whole project then transaction costs could be minimized. Because the entire project was considered too big for one contract (government considered there would be hardly firms in the market which would have the capacity to handle such a project entirely, so competition would be minimal), it was split into eight separate ones, including one for the tunnel. The split caused an increase in coordination costs. Government was responsible for the coordination, but because of
the complexity, the information asymmetry and the lack of expertise this turned out to big a task.

Moreover due to the ‘culture’ at the ministry and the lack of expertise in D&C contracting, the contracts were designed by government according the rules of traditional contracting. In relation to that budget steering was the main instrument to guide behavior of the private firms, which caused adversarial reactions and provoked strategic behavior (see below)

The negotiation, drafting and monitoring of D&C contracts demand a specific type of expertise: the HSL case shows that such professionalism was not present neither in government nor in firms.

Finally the case showed that adequate control mechanisms are lacking in government institutions, like the Ministry of Finance (Directorate Financial Economic Affairs) and the Ministry of Transport, Public Works and Water Management (Department Accounting). Moreover, parliamentary control was fully absent mainly due to a lack of information (Koppenjan and Leijten, 2005).

4. At layer 4 we position the actors.

At level four the actors with different objectives, information, power and perceptions are located. From the analysis of the case of the D&C contracts of the HSL-South, it became clear that actors not only had different objectives and information, but also that the culture of negotiating, setting guidelines, exchanging information, etc. was so different that during the process of design and implementation the ‘public-private-partnership’ turned into a rather hostile ‘public-private game of tactics and trench-war fare.

With respect to the actors the HSL case shows the role of perceptions and importance ‘mental maps’: politicians, civil servants and management of firms are locked into their perceptions and it turned out to difficult to make the switch to a culture and way of thinking that fit the new type of arrangements of PPP and D & C contracting. Switching to another more or less imposed blueprint is not simply a matter of ‘pushing some buttons’, but needs careful design of the process. The analysis of the case shows that the conditions for a learning process were not present. On the contrary: the blueprint view dominated both in politics and business. When the process evolved, the ‘old’

attitudes, cultures and ways of doing business caused dramatic results in the new PPP and D&C environment. When the tender board was confronted with offers exceeding the budget with 43% the reaction was one of panic, of halting the procedure (Koppenjan and Leijten, 2005). The actors fell back into their old, well-known patterns of behaviour and the formal institutions of the ‘old’ regime were applied like negotiations on the budget, the adaptations of the offers in terms of quality, the shifting of risks and when needed arbitrage was applied. All this caused a very hostile relationship between the actors.

Because the process towards the institutional design of the market with PPP and D&C contracts was not well designed, or better: not taken into consideration at all, it was never made explicit what the requirements for a successful institutional and process design would be anyway.

Process design

The dynamic view stresses the importance of process design as an element of the design issue: in a multi-actor, multi-disciplinary approach towards infrastructures, the technological design, the institutional design and the process design are interwoven and mutually dependent (figure 5). This insight makes for strong pleas of open, participatory processes in which variety is stimulated; information exchange is facilitated via well-designed participatory processes where exploration is stimulated. Mutual understanding, trust and mutual interests, are all crucial elements of effective and efficient dynamic institutions (de Bruijn, ten Heuvelhof and in ’t Veld, 2002, and Correljé, 2005).
5. Conclusions

The dynamic learning approach has taken us back to figure 1: the domains of technology, economics and institutions co-evolve over time often in a gradual, incremental way, but sometimes also in a revolutionary, conflicting way. The static blueprint economic perspective provides basic insights into the design of economizing institutional arrangements, but hopelessly fails in the case of designing markets in infrastructures where technology, economics and institutions are closely interrelated and where public and private actors chase their own objectives playing their own strategic games. It is suggested that the static contracting schema needs extension to include on the one hand the domains of technology and the economics of production and on the other hand the interplay between public and private actors. We expect then to become better aware of questions about:

- The historical lock-ins that exist inside each domain: technological trajectories determine the room to manoeuvre, investments in the economic domain of production can be ‘sunk’ specifically into long lasting physical networks and institutional lock-ins can make switching costs to other arrangements extremely high.
- Not only the constraints but also about the possibilities to design new market arrangements and new technological solutions and about how the three domains are related
- The trade-offs that exist within the domains like for instance the trade-off in the domain of the economics of production between the technical and allocative efficiencies. There often seems to be a trade-off between exploiting existing structures in such a way that production- and transaction costs are minimized on the one hand and the exploration of new structures on the other. Then we have arrived at the real complexity of the design issue: trying to combine the equilibrium-oriented static blueprints with the process-oriented dynamic efficiencies, we face trade-offs and dilemmas (Nooeboom, 1999).
- The trade-offs that exists between the domains, for example the governance structure that would be efficient in the domain of the economics of production from the point of view of economies of scale (specialisation) can be the opposite of the governance structure that would be efficient in the domain of institutions (vertical integration).
- The interrelations between different levels of different domains, for instance the stimulating influence of tax rules at level 2 of the domain of institutions
and the continuation of an inefficient technology at level 2 in the domain of technology

- The implications of a political choice at level 3 in the domain of institutions (like a PPP) for the other levels of that domain as well as the implications for the other domains like the innovation of production processes.

Among others these questions form a challenging research agenda for the coming years for the section of "Economics of Infrastructures". I am looking forward to cooperate with the members of the section and the other sections of the faculty Technology, Policy and Management in order to find answers and to contribute to a more effective and efficient design of markets in infrastructures.

Thank you for your attention.

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