ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE ENGINEERING AND TECHNOLOGY

DEVELOPING A NEW INSTITUTIONAL ECONOMICS FRAMEWORK IN URBAN TRANSPORT SYSTEMS: AN INSTITUTIONAL ANALYSIS OF ISTANBUL'S URBAN TRANSPORT

Ph.D. THESIS

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To all those who dedicate their lives to the progress of science and the pursuit of truth,

FOREWORD

This study is set out to apply theories and approaches associated with New Institutional Economics for the urban transport field, in general, and Istanbul's urban transport, in particular, in order to contribute to theoretical understanding of how urban transport systems work.

First of all, I would like thank Assoc. Prof. Dr. Dilay Çelebi GONIDIS, my thesis advisor, for her support and guidance throughout my PhD study period. She encouraged me to freely pursue my own academic path and assisted me all along the way.

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ABBREVIATIONS

AVL : Automatic Vehicle Location
BRT : Bus Rapid Transit
CRM : Customer Relationship Management
CT : Competitive Tendering
DA : Direct Award
EU : European Union
GC : Gross Cost
GDP : Gross Domestic Product
IETT : Istanbul Electricity Tunnel and Tramway
IMM : Istanbul Metropolitan Municipality
MTA : Metropolitan Transport Authority
NC : Net Cost
NIE : New Institutional Economics
NPBC : Negotiated Performance Based Contracts
OAS : Otobus AS
OHO : Ozel Halk Otobusleri
PB : Performance Based
PCT : Partial Competitive Tendering
PrGC : Performance Based Gross Cost
PSO : Public Service Obligations
SME : Small and Medium Sized Enterprises
TCC : Transportation Coordination Committee
TCE : Transaction Cost Economics
TQM : Total Quality Management
TSI : Turkish Statistical Institute
UPT : Urban Public Transport

SYMBOLS

TL **:** Turkish Lira

US $ **:** United States Dollar

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DEVELOPING A NEW INSTITUTIONAL ECONOMICS FRAMEWORK IN URBAN TRANSPORT SYSTEMS: AN INSTITUTIONAL ANALYSIS OF ISTANBUL'S URBAN TRANSPORT

SUMMARY

New Institutional Economics (NIE) is a rapidly growing interdisciplinary economic perspective which seeks to explain the role of institutions in the performance of socio-economic systems. It encompasses various economic theories including transaction cost economics, agency theory, contract theory and property rights economics. Although NIE-based approaches have been utilised in different sectors and policy areas, management and organisation of urban public transport (UPT) systems is a policy area where the implications of NIE-related theories have not been thoroughly explored. The thesis provides a novel perspective for the examination of UPT systems based on an extensive literature review of NIE literature. UPT systems are complex and involve a variety of transport actors such as transport authorities, regulators, operators and passengers. These actors interact with each other as embedded in an institutional environment which structures the rules, hence determines the incentives, roles and liabilities for the actors. However, previous studies have generally taken this institutional environment as given and have not problematized it.

This thesis seeks to provide a concise literature review of UPT through the perspective of NIE to delve into the institutional configuration of UPT systems so that an institutional account of UPT is given. An institutional framework is proposed to help structure the current literature on UPT. To explore the applicability of NIE in conceptualizing and problematizing the issues concerning the management of UPT, the thesis attempts to delineate the institutional landscape of UPT. The informal and formal institutions, governance structures and contractual relationships in UPT are examined through the lens of NIE. These institutional levels constitute the building blocks for the institutional arrangement of the UPT systems, and the proposed institutional framework for the analysis of UPT systems reviews and examines each institutional level in a systematic way. The thesis explores the potential added-value that NIE provides, identifies the research gaps in the literature, and shows the future avenues for NIE-inspired UPT studies.

The aim of this thesis is to identify and examine the institutional issues in UPT systems from a NIE perspective. The concepts and theories developed within the NIE literature, including transaction costs, agency theory, contracts and property rights are particularly relevant in that regard since they help conceptualize the interrelated role of organizations as actors within their institutional settings. These actors have interests, incentives, powers, liabilities, and actions which constitute the institutional environment. Asymmetries among the transport actors in terms of power, information and resources should be considered while conceptualizing and examining the institutional environment. Therefore; a general account of actor relations within the public transport field is needed for any institutional analysis so that a robust

institutional framework can be developed to mitigate the externalities resulting from those relations. To do this, two main branches of NIE are employed in this thesis: the Williamsonian transaction cost economics branch focusing on the structure of governance and organizational arrangements and the Northean institutional analysis branch dealing with the institutional change and institutional environment.

Rapid urban growth and resulting urban transport problems in developing cities trigger major transformative reform attempts. However, these attempts might fail due to ignoring the role of the institutional environment. Changing the governance structure from a fragmented governance form to a centralized transport authority form is such an institutional change that should take into account the surrounding institutional arrangements. In this thesis, drawing from NIE literature, a new framework for institutional change in urban transport is proposed to guide those institutional initiatives.

To materialize the theoretical considerations regarding this institutional framework, Istanbul's urban transport system constitutes the case study of the thesis. Attempts to establish a metropolitan transport authority (MTA) in Istanbul have led us consider the institutional problems faced by Istanbul. Having a population of nearly 15 million people with radically increasing urban transport problems, city of Istanbul has considerable amount of the urban transport governance problems due to its fragmented and weak institutional setting. Based on the developed framework and lessons drawn from the Istanbul case, our results highlight the importance of examining the institutional environment of urban transport systems by identifying the institutional levels in institutional transformation initiatives.

In recent years, concern has grown over good practices in the procurement processes in public transport. Although promoting competition by competitive tendering to gain efficiency and increase service quality has gradually become common around the world, the applicability of this model in weak institutional environments has some uncertainties. Drawing from NIE literature, transaction cost economics (TCE) approach presents important theoretical insights to comprehend the nature of authority and operator relations by underlining the institutional factors that make such procurements effective or not.

It is argued that the extent to which transaction structures are embedded in the institutional framework has a substantial impact on the long-run performance of the public transport contracts. A qualitative case study of the experience of Istanbul's public transport system, a hybrid regime combining the elements of direct award and tendering and composed of both formal and paratransit transport modes, is proposed to support the theoretical arguments. The thesis reveals that all-encompassing contractual solutions which do not take into account the broader institutional environment (culture, norms, legal rules, property rights etc.) may not work as intended, calling for more hybrid solutions, particularly in weak or developing institutional settings.

Drawing on an agency theory approach, the thesis also examines conflict of interests and the resulting agency costs in the provision of urban public transport services in Istanbul's public transport system, particularly the private bus and minibus operators' relationship with local government. The agency problem in Istanbul's urban mobility system shows itself most explicitly in private bus and minibus operators because of the net-cost (NC) contract model in place. The private bus and minibus operators' relationship with local government is examined as a case study of agency relationships.

Conceptually, government transport authorities and transport operators, together with the passengers, are the main actors of this urban public transport system. They all have distinct needs, interests and requirements and interact with each other, all embedded in a specific institutional environment. Service quality provided by public transport operators depends on the positive interactions between these actors. Whereas passengers demand reliable, affordable, safe and comfortable mobility services, private bus and minibus operators aim to increase their revenue and maximize their profits. In contrast to this, government bus operators provide in-house bus services without much concern for profitability. Regulators or local authorities, on the other hand, are expected to set up an institutional environment where passengers' and operators' expectations are met in a satisfactory manner.

Empirical analyses and interviews with key agents demonstrate that agency costs are shown to be the result of misaligned interests between the government transport authority and private operators that lead to reduced service quality in terms of safety, comfort, reliability and affordability. We conclude that the agency costs of current NC contracting on passengers in Istanbul has deficiencies and propose instead a performance-based gross-cost (PrGC) contracting model. PrGC contracting can alleviate agency costs by changing the incentives of operators where regulatory and financing mechanisms are not enough to handle NC contracting. The optimal payment model is also selected by using a non-linear programming. Istanbul represents some transferable lessons and implications, especially for developing cities around the world.

KENTİÇİ ULAŞIM SİSTEMLERİ İÇİN YENİ KURUMSAL İKTİSAT ÇERÇEVESİ GELİŞTİRMEK: İSTANBUL'UN KENTİÇİ ULAŞIMININ KURUMSAL ANALİZİ

ÖZET

Yeni Kurumsal İktisat (YKİ), kurumların sosyo-ekonomik sistemlerin performansı üzerindeki rolünü açıklamaya çalışan ve giderek yaygınlaşmakta olan disiplinlerarası bir ekonomik yaklaşımdır. YKİ; işlem maliyeti ekonomisi, vekalet teorisi, sözleşmeler teorisi ve mülkiyet hakları ekonomisi gibi farklı ekonomik teorileri içermektedir. YKİ temelli yaklaşımlar farklı sektörlerde ve kamu politikaları araştırmalarında kullanılsa da, kentiçi ulaşım sistemlerinin yönetim ve organizasyonunda YKİ temelli ekonomik teori ve yaklaşımların sonuçları araştırma konusu olmamıştır. Bu doktora tezi, YKİ literatürünün geniş çaplı araştırma ve yorumlanması üzerine bina edilmiş olup, kentiçi ulaşım sistemlerinin yönetimi için yeni bir bakış açısı ve çerçeve sağlamaktadır. Kentiçi ulaşım sistemleri karmaşık sistemler olup ulaşım otoriteleri, yerel yönetimler, işletmeciler ve yolcular gibi ulaşım aktörlerini içermektedir. Bu aktörler birbiriyle kurumsal bir çevre içerisinde etkileşime geçmektedir. Bu kurumsal çevre; kuralları yapılandırırken, aynı zamanda aktörlerin rollerini, yükümlülüklerini ve teşvik yapılarını da belirlemektedir. Literatürde kentiçi ulaşım sistemleri ile ilgili önceki çalışmalarda bu kurumsal çevre verili kabul edilip sorunsallaştırılmamıştır.

Bu tezin amacı, YKİ perspektifinden kentiçi ulaşım sistemlerinin yönetilmesindeki kurumsal konuları tespit ve analiz etmektir. YKİ literatüründe çokça kullanılan işlem maliyeti, vekalet teorisi, sözleşmeler ve mülkiyet hakları gibi teori ve kavramlar, aktörlerin ve organizasyonların kendi kurumsal düzlemleri içerisindeki karşılıklı etkileşimlerinin kavramsallaştırılmasında yardımcı olmaktadır. Aktörlerin çıkarları, teşvik yapıları, güçleri, yükümlülükleri ve eylemleri kurumsal çevreyi şekillendirmektedir. Ulaşım aktörleri arasında gücün, bilginin ve kaynakların asimetrik dağılımı, kurumsal çevrenin kavramsallaştırılmasında ve irdelenmesinde özellikle dikkate alınmalıdır. Etkin işleyen bir kentiçi ulaşım sistemi için, kurumsal mimarinin aktörler arasındaki ilişkilerin sonucunda ortaya çıkan dışsallıkları önleyecek şekilde düzenlenmesi gerekmekte bu da kurumsal analizi gerekli kılmaktadır. Bu amaçla, tezde YKİ'de sıklıkla kullanılan ve Nobel Ekonomi Ödüllü iki iktisatçı olan Oliver Williamson ve Douglass North tarafından geliştirilen teorilerden yararlanılmıştır. Williamson tarafından geliştirilen işlem maliyeti ekonomisi, yönetişim ve organizasyonel yapıların düzenlenmesine odaklanırken, North tarafından geliştirilen kurumsal analiz yaklaşımı, kurumsal değişim ve kurumsal çevreyi açıklamakta kullanılmaktadır.

Gelişmekte olan kentlerdeki hızlı kentsel büyüme ve sonucunda ortaya çıkan kentiçi ulaşım sorunları büyük çaplı reform girişimlerini gerektirmektedir. Fakat bu reform çabaları genellikle kurumsal çevrenin rolü göz ardı edildiğinden başarısız olabilmektedir. Kentiçi ulaşımın yönetişim yapısını ulaşım otoritesi oluşturmak üzere düzenlemek, kurumsal çevreyi de hesaba katması gereken kurumsal değişime bir

örnektir. Bu tezde YKİ'den yararlanarak, bu şekilde ortaya konacak kurumsal girişimlere kılavuzluk etmek üzere bir kurumsal değişim çerçevesi önerilmektedir.

Yerel yönetimlere bağlı ulaşım otoriteleri ve işletmecileri, yolcularla birlikte kentiçi ulaşım sisteminin ana aktörlerini oluşturmaktadır. İşletmeciler tarafından sağlanan hizmet kalitesi, aktörler arasındaki pozitif ilişkilerin derecesine bağlıdır. Yolcular güvenilir, öngörülebilir, ekonomik ve konforlu bir ulaşım hizmeti talep ederken, otobüs işletmecileri yolculuk gelirlerini artırarak karlılıklarını eniyilemeye çalışmaktadır. Bununla birlikte, belediyelerin sahipliğindeki otobüs işletmeleri karlılık temelli olmayan ulaşım hizmeti sağlamaktadır. Diğer taraftan, yerel ulaşım otoritelerinin de yolcuların ve işletmecilerin karşılıklı beklentilerini tatmin edici bir düzeyde karşılayacak kurumsal bir çevreyi oluşturması beklenmektedir.

Son yıllarda, kentiçi ulaşımda ulaşım otoritesi ve işletmeciler arasındaki ilişkilerin düzenlenmesine dair endişeler artmıştır. Dünyada ulaşım otoriteleri tarafından yapılan sözleşmelerle belirli periyotlarda ulaşım hizmeti vermek üzere seçilen işletmeciler sayesinde maliyet etkinliği ve hizmet kalitesi artırılmaya çalışılsa da bu yöntemin iyi yapılandırılmamış kurumsal çevrelerde uygulanabilirliği bazı belirsizlikleri beraberinde getirmektedir. Bu tezde YKİ içerisinde yer alan teorilerden biri olan işlem maliyeti ekonomisinden faydalanarak, kurumsal faktörlerin otorite işletmeci ilişkileri üzerine etkisi kavramsallaştırılmakta ve sözleşme yönteminin etkinliğini tartışılmaktadır.

Tez beş ana bölümden ve bölümlere dair yayınlanan makalelerden oluşmakta olup, her bölüm diğer bölüme altlık oluşturacak şekilde yapılandırılmıştır. Birinci makalenin yer aldığı ikinci bölümde, YKİ yaklaşımlarının kentiçi ulaşım sistemlerinin yönetimi için sunduğu yaklaşımlar, teoriler ve bakış açıları incelenmektedir. İkinci makalenin yer aldığı üçüncü bölümde, kurumsal değişim yaklaşımları kullanılarak İstanbul'da kurulması planlanan ulaşım otoritesi ile ilgili değerlendirmelere yer verilmiştir. YKİ'nin sağladığı işlem maliyeti ekonomisi ve vekalet teorisi gibi yaklaşımlar dördüncü ve beşinci bölümde yer alan İstanbul'un kentiçi ulaşım sistemindeki kurumsal sorunların çözülmesinde kullanılmaktadır. Son olarak altıncı bölümde doğrusal olmayan programlama yöntemiyle İstanbul için otorite ve işetmeci arasında en optimum ödeme şekli seçilmiştir. Böylelikle bu tezle gerek teorik gerekse de uygulamalı yönüyle YKİ ve ulaşım literatürüne önemli katkı sağlamak hedeflenmiştir.

Tezin ikinci bölümünde, YKİ perspektifinden kentiçi ulaşım sistemlerinin yönetimi ile ilgili kapsamlı bir literatür taraması sağlanmaktadır. Böylelikle kentiçi ulaşım sistemlerinin kurumsal konfigürasyonu ortaya konulmaktadır. Bu amaçla, kentiçi ulaşım sistemlerine dair mevcut literatürü yapılandırmak üzere YKİ temelli kurumsal bir çerçeve önerilmektedir. Kentiçi ulaşım sistemlerinin yönetimi ile ilgili konuları kavramsallaştırmak ve sorunsallaştırmak amacıyla YKİ'nin uygulanabilirliği araştırılmakta ve sonucunda kentiçi ulaşımın kurumsal resmi ortaya konulmaktadır. Kentiçi ulaşımdaki enformel ve formel kurumlar, yönetişim yapıları ve sözleşme ilişkileri gibi kurumsal katmanlar YKİ'nin sunduğu perspektifle incelenmektedir. Bu kurumsal katmanlar kentiçi ulaşım sistemlerinin kurumsal mimarisinin yapıtaşlarını oluşturmakta ve önerilen kurumsal çerçeve bu katmanların kendi içindeki ve aralarındaki ilişkileri sistematik bir şekilde analiz etmektedir. YKİ'nin potansiyel katma değeri araştırılmakta, literatürde konuyla ilgili araştırılmamış alanlar tespit edilmekte ve gelecekte ortaya konacak YKİ-temelli çalışmalar için yol gösterilmektedir.

Tezin üçüncü bölümünde, önerilen kurumsal çerçevede içerilen teorik yaklaşımları somutlaştırmak amacıyla, İstanbul'un kentiçi ulaşım sistemi vaka çalışması olarak ele alınmaktadır. İstanbul'da metropoliten ulaşım otoritesi kurma çalışmaları İstanbul'un yaşadığı kurumsal sorunları gündeme getirmiştir. Giderek etkisi artan kentiçi ulaşım sorunlarıyla yaklaşık 15 milyon nüfusa sahip İstanbul, kentiçi ulaşım yönetişimi ve kurumsal çevreyle ilgili sorunlara dair kullanışlı bir örnek sunmaktadır. Geliştirilen kurumsal çerçeve ve İstanbul vakasından elde edilen sonuçlar, kentiçi ulaşım sistemleriyle ilgili kurumsal değişim girişimlerinde kurumsal çevreyi analiz etmenin ve kurumsal katmanları tespit etmenin ne kadar önemli olduğunun altını çizmektedir.

Tezin dördüncü, beşinci ve altıncı bölümlerinde, otorite ve işletmeci arasındaki işlem yapılarının ve arayüzlerinin kurumsal çevre içesinde ne kadar iyi yapılandırıldığının kentiçi ulaşımdaki sözleşmelerin uzun dönemli performansı üzerinde ciddi bir etkisinin olduğu savunulmaktadır. Ortaya konan teorik argümanları desteklemek üzere; formal ve paratransit ulaşım modlarını içeren hibrit bir ulaşım sistemine sahip olan İstanbul'un toplu ulaşım sistemini ele alan kalitatif vaka analizi çalışması önerilmektedir. Çalışmanın sonuçları; daha geniş kurumsal çevreyi (kültür, normlar, yasal mevzuat, mülkiyet hakları vb.) içermeyen sözleşmesel çözümlerin başarılı sonuçlar vermeyebileceğini ortaya koymakta ve özellikle gelişmekte olan kurumsal yapılara sahip kentler için daha hibrit çözümler önermektedir.

İstanbul'un kentiçi ulaşımında yer alan işletme ve kurumlarla yapılan görüşmeler ve diğer analizler göstermektedir ki ulaşım otoritesi ve işletmeciler arasındaki vekalet maliyetleri güvenlik, konfor, güvenilirlik ve ekonomiklik gibi başlıklarda daha düşük hizmet kalitesine sebep olmaktadır. Net maliyete dayalı mevcut işletmeci ilişkilerinin sebep olduğu vekalet maliyetleri bu hizmet kalitesi sorunlarının sebebi olarak ortaya konmakta ve bunun yerine performans bazlı brüt maliyete dayalı bir sözleşme modeli önerilmektedir. Bu model, düzenleyici ve finansal mekanizmaların net maliyete dayalı sözleşmenin yarattığı problemleri ortadan kaldırmada yeterli olmadığı yerlerde, işletmecilerin çıkarlarını değiştirerek vekalet maliyetlerini azaltmayı hedefler. İstanbul için önerilen bu model, özellikle gelişmekte olan şehirler için transfer edilebilir dersler ve sonuçlar içermektedir.

1. INTRODUCTION

The role of urban transport systems in reducing traffic congestion, providing alternative means of travel for growing car usage and contributing to sustainability makes them essential for the quality of urban life. Urban transport systems are complex systems which include social, economic, political, technological and organizational aspects. To develop and implement effective policies to improve the system, the relationships between these aspects as well as the actors constituting the system should be considered in an integrated and holistic way. Understanding the challenges on the way to efficient and sustainable urban transport systems is key to any effort for urban change and transformation. Rapid urban growth and resulting urban transport problems in developing cities trigger major transformative reform attempts. However, these attempts might fail due to overlooking the institutional environment.

All public transport entities or organizations constituting urban transport systems are embedded in an institutional environment which shapes the interests, incentives and actions of these organizations. Defined as “the rules of the game”, institutions play an important role in the organization of urban passenger transport systems. The interdependence of actors providing complementary and integrated transport services requires an institutional framework by which roles, interests and actions of the urban passenger transport actors are defined. An institutional analysis of urban transport seeks to consider the implications of institutional elements on the performance of the overall urban transport system. New Institutional Economics (NIE) is the body of literature which deals with the institutions and the institutional environment which characterize the rules within which organizations and markets operate. NIE encompasses different economic theories such as transaction cost economics (TCE), the principal-agent approach (agency theory), contract theory and property rights economics. This is especially important for developing countries and metropolitan areas where rapid urban growth and resulting transport problems together with a weak institutional setting make consideration of institutions indispensable in urban passenger transport analysis.

This thesis intends to fill an important gap in the literature by exploring the implications of NIE for understanding urban transport issues with a comprehensive review and utilization of NIE literature. Although there are many studies in the literature addressing public transport problems by partially utilizing NIE-related concepts, theories and approaches; this thesis is the first attempt to "systematically and holistically" analyze and capitalize on the insights generated by NIE. These studies generally deal with agency theory, transaction cost economics or institutional change approaches separately to illuminate one aspect of a specific urban transport problem. This thesis, on the other hand, is the first systematic attempt that comprehensively brings together the vast literature in both urban transport as well as NIE and adds value to the literature through three important ways:

i) broadening the extant literature of urban passenger transport with novel perspectives from NIE and doing the same for the literature of NIE with application in a new sector, which has not been systematically researched before,

ii) providing a conceptual and theoretical framework to synthesize the literature from both NIE and urban passenger transport,

iii) identifying the areas in urban transport already studied by NIE-related approaches and the research gaps to open new avenues for further studies.

1.1 Purpose of Thesis

The main objective of this thesis is to explore the implications of NIE for understanding urban transport issues with a comprehensive review of NIE literature and apply the ideas, concepts and insights generated for Istanbul's urban transport context as a case study. This PhD thesis aims to extend the discussion of the role of institutions in urban transport systems. It will also attempt to extend the empirical applications of NIE by providing a new field, urban transport. The thesis will shed new light on urban transport policy discussions, by presenting an institutional framework to embed those policy issues. The insights and results from the case study of Istanbul will be particularly relevant for developing urban settings, where the institutional setting is relatively weak and ineffectual. NIE's interdisciplinary outlook, on the other

hand, provides appropriating the diverse but interrelated fields such as economics, political science, law, organization theory, management and sociology in understanding and enhancing the dynamics of socio-economic systems like urban transport. This is especially important for systemwide reform projects in urban transport area where comprehending the relations between system elements requires a multidimensional perspective like NIE.

The thesis is comprised of five papers, each of which constitutes one chapter of the thesis. They examine the issue of institutional environment in urban transport systems from a different perspective and institutional level.

The aim of the 1st paper in Chapter 2 is:

- to explore the implications of NIE for understanding urban transport issues with a comprehensive review of NIE literature.

The aim of the 2nd paper in Chapter 3 is:

- to examine the case of Istanbul's setting up a metropolitan transport authority (MTA) from an institutional change perspective by analyzing the 2nd institutional level (formal institutional environment).

The aim of the 3rd paper in Chapter 4 is:

- to examine the agency costs in the provision of urban public transport services in Istanbul's public transport system, particularly the private bus and minibus operators' relationship with the local government, by using agency theory concepts and analyzing the 3rd and 4th institutional levels.

The aim of the 4th paper in Chapter 5 is:

- to theoretically show the relationship between institutional environment, transaction costs between operators and authorities, governance types and procurement models; and empirically analyze Istanbul's public bus transport setting.

The aim of the 5th paper in Chapter 6 is:

- to select the optimal payment model between operators and the authority by analyzing the 4th institutional level to address the remuneration and risk allocation issues among the stakeholders.

Each chapter, associated with each institutonal level, is an explanation of previous chapter. Whereas the first institutional level (Chapter 2) provides a theoretical explanation of the institutional landscape, the last institutional level (Chapter 6) specifically addresses Istanbul's public transport problems. Therefore, chapters gradually concretize the institutional structure of the urban transport systems through Istanbul's case. The overall aim of all chapters is to provide an institutional lens through which urban transport problems can be conceptualised and contextualised. The thesis seeks to combine social and technical approaches through NIE framework so that a diverse and inter-disciplinary forum where a variety of perspectives are included can be established. In this respect, realist and interpretive research approches with their epistemeological and ontological implications are adopted and synthesised to allow the discussion of a plurality of perspectives. The aim of the thesis is to provide novel mental models, frameworks and solution sets for the urban tranpsort problems instead of one specific solution.

1.2 Literature Review

In this thesis, two different literature at the same time are examined to seek out the implications of one literature on the other. While it is attempted to find out theories, perspectives, insights and approaches from NIE literature to inform urban passenger transport literature, at the same time, urban passenger transport literature is scanned and framed as a new applied field to enlarge the empirical scope of NIE in understanding the features of real world institutions and organizations. For NIE literature, the fundamental sources of this literature are focused, which span a wider time period. For urban passenger transport, on the other hand, the recent literature to capture the current state of knowledge is focused, trying to stay within the literature of last ten years as much as possible.

With regards to NIE, the central argument of the theories and approaches related with NIE is that institutions matter, and it is worth working through the relationship between institutional structure and performance of any socio-economic system (Richter, 2005;

Furubotn and Richter, 2005). NIE first emerged when Coase (1937, 1960) underlined the importance of transaction costs to analyze the reasons for the existence of the firm. The concept of transaction costs was later applied in various issues of organizational theory (Williamson, 1975; Alchian and Demsetz, 1972). Institutional factors such as property rights and governance structures are endogenized in NIE studies to reduce transaction costs, uncertainties as well as externalities and to increase collective social benefits from coordinated or cooperative actions (Rutherford, 2001). Key concepts of NIE are mainly transaction costs, property rights and contracts (Ménard and Shirley, 2012). The economics of property rights became the topic of interest in early studies of NIE (Alchian, 1961; Demsetz, 1967). NIE not just provides tools for examining the reasons for macroeconomic and political performance, but it is also helpful to address the issues related with the performance of smaller organizations (Alston et al., 2014). NIE is distinguished from other economic theories by its emphasis on institutions as rules and norms, its micro-level analysis of firms and market organizations together with their public policy implications (Ménard and Shirley, 2014).

Two approaches stand out within NIE tradition which are associated with Oliver E. Williamson and Douglass C. North. North (1990) develops an analytical framework to explain how institutions and institutional change influence the performance of economies. According to North, institutions, or in other words "institutional environment" constitute the general rules which shape and constrain the actions of economic actors in individual level as well as organizational level. Belief systems, ideologies and mental models are important institutional factors in Northean approach (Mantzavinos et al., 2004; Denzau and North, 1994; North, 1994). The selection of an organizational form is a result, not just of rational choice and technical requirements, but also of legitimacy concerns (Meyer and Rowan, 1977). Williamson, on the other hand, emphasizes the transaction cost minimization in the selection of a certain governance type (Williamson, 1979; 1981). Developing a TCE view of governance structures, he regards the transaction as the central unit of analysis and argues that comprehension of transaction cost economizing is crucial for the study of organizations.

NIE-related approaches have been applied in understanding the features and development of institutions and its effect on economics performance in various

countries, sectors, markets and organizations. Since this thesis adopts a sectoral analysis level, the studies carried out in different sectors using a sectoral point of view are looked through, having a specifically NIE-oriented approach. Table 1.1 gives a list of those studies categorized according to their sectors, countries or cities and the issues that they deal with.

Table 1.1 : Empirical studies for sectoral applications of NIE.

Study	Sector	Country	Issues
(Saleth and Dinar, 2008)	Water	Cross-country	quantitative analysis of the structural and functional linkages within water institutions and promoting institutional reforms
(Ghafele and Gibert, 2012)	Tourism	Sierre Leone and Crotia	the role of collective trademarks in enhancing the ability of tourism clusters to stimulate economic growth, local ownership and innovative governance
(Ménard, 2011)	Public sector	General	the monitoring of environmental problems
(Hwang, 2015)	Public sector	General	contracting of local public service
(Caria and Rodrigues, 2014)	Financial reporting	Portugal	standardization of accounting practices in Portugal
(Hubbard, 1997)	Agriculture	General	contracting behavior and agricultural development
(Dorward et al., 1998)	Agriculture	Ghana and Southern Tanzania	implications of market liberalization on cash crop production
(Signorini et.al., 2015)	Electricity	Brazil	the drivers of the institutional change and economic growth in electricity sector
(Schlüter, 2007)	Forestry	General	to explain the institutional change drivers and the role of ideologies in forestry sector
(Abdul-Rahman et al., 2014)	Banking	Malaysia	failure of profit-loss sharing contracts in Malaysian Banking sector
(Shanahan, 1999)	Labor market	Australia	role of ideological beliefs in labor market institutions through time in Australia
(Zhu and Thatcher, 2010)	E-commerce	Cross-country	the impact and effect of national institutional environment on global e-commerce adoption
(Gibb and Nygaard, 2006)	Social housing	United Kingdom and Scotland	the fundamental contractual and regulatory relationships in social housing from the perspective of the key actors in the sector

The reason to provide such a list is to highlight the lack of NIE-oriented studies within transport sector, in general, and urban passenger transport sector, in particular. Although there are many studies using an institutional analysis approach in transport studies (Gwilliam, 1979; Rietveld and Stough, 2004; 2005; 2007; Haynes et al., 2005; Anderton, 2010) and urban transport studies (Macário, 2005; 2007a; 2007b; Low and Astle, 2009; Macário and Spandou, 2010; Stone, 2014; Macário, 2016); these studies do not employ a specifically NIE perspective in their analysis. Also, apart from

Macário's studies referred above, these studies tend to regard institutions as the organizations managing transport or urban transport sector. The most widespread conception of institutions as "the rules of the game" is lacking in those studies. The only study having a specific NIE orientation in transport studies include a study by Groenewegen and De Jong (2008) which tries to explain the institutional change in the construction and maintenance of transport infrastructure in the context of liberalization in Nordic countries. In addition to this study, Button (2010) refers to NIE, though not in a detailed manner, in his book "Transport Economics", when explaining the institutional structures.

1.3 Hypothesis

The hypothesis that this PhD thesis is built on is that institutions and institutional environment in urban transport systems is the main driver of system performance. Therefore, utilizing NIE perspective for conceptualizing, analyzing and revealing this institutional terrain in urban transport systems is the unique theoretical contribution of this thesis. The other unique contribution of the thesis is empirical, aiming to examine Istanbul's urban transport system by using the developed ideas, concepts and theories adopted from NIE. Istanbul's urban transport problems are analyzed in-depth by delving into the institutional problems, hence trying to show the root causes of chronic urban transport problems in Istanbul. Therefore, the thesis is the first systematic attempt to conceptualize the problems from a systematic and comprehensive organizational and institutional perspective. The recommendations are put forward to improve the urban transport performance in Istanbul as an overall system, rather than providing a partial solution.

2. A REVIEW OF URBAN PUBLIC TRANSPORT SYSTEMS FROM NEW INSTITUTIONAL PERSPECTIVE[1]

2.1 Introduction

The urban public transport (UPT) systems have a significant role in reducing the traffic congestion, providing alternative means of travel for growing car usage and contributing to the sustainability for the quality of urban life (Vuchic, 2005). UPT systems are complex systems (Rietveld and Stough, 2004) which include social, economic, political, technological and organizational aspects. To develop and implement effective policies to improve the system, the relationships between these aspects as well as the actors constituting the system should be considered in an integrated and holistic way. Main actors of UPT systems are government, operators, and passengers. While the government in the form of a regulator or transport authority plays a regulatory role in the management of public transport systems, operators provide public transport services to the passengers. In some cases, local governments or municipalities directly provide public transport services to the passengers with or without franchised, contracted or deregulated private operators. Main modes of public transport include bus, rail, waterborne and paratransit modes with a variety of subcategories.

All public transport entities or organizations constituting UPT systems are embedded in an institutional environment which shapes the interests, incentives, and actions of these organizations. Defined as "the rules of the game" (North, 1990), institutions play an important role in the organization of UPT systems. The interdependence of actors providing complementary and integrated transport services requires an institutional framework by which roles, interests, and actions of the UPT actors are defined. Deregulated models, for example, can result in uncoordinated and disintegrated service provision unless such a well-defined institutional framework is in place. The

[1] This chapter is based on the paper "Canitez, F (2018). Urban public transport systems from new institutional economics perspective: a literature review. Transport Reviews." DOI:10.1080/01441647.2018.1552631

role of institutions is also crucial in the selection of cost-efficient and effective UPT governance models. The institutional framework of UPT systems includes both informal (e.g. habits, traditions, customs, and norms) and formal (e.g. laws, property rights and regulations) institutional elements (Williamson, 2000). The organizational forms, governance structures, contractual practices and procurement methods can be given as examples of institutional issues in the management of UPT, which directly affect the performance of those systems.

Similar to the neoclassical economics view, classical urban transport management and planning approaches have tended to assume perfect rationality, full information and competitive markets (Small, 2013), deemphasizing the role of institutions. Phenomena in urban transport such as travel behavior, transport demand, and decisions concerning investment are explained by aggregating over the behavior of transport actors (Schwanen et al., 2011). Most of the studies in UPT management and organization literature take the institutional framework as granted and do not make the analysis of institutions as the object of their studies. However, transport actors relate with each other as embedded in an institutional environment which condition the behavior of transport actors.

An institutional analysis of UPT seeks to consider the implications of institutional elements on the performance of the overall UPT system. New Institutional Economics (NIE) is the body of literature which deals with the institutions and the institutional environment which characterize the rules within which organizations and markets operate (Ménard, 1995). NIE encompasses different economic theories such as transaction cost economics (TCE), the principal-agent approach (agency theory), contract theory and property rights economics (Williamson, 2000). The main theoretical assumptions of NIE include positive transaction costs between the actors, incomplete contracts, costly information and imperfect property rights (Ménard and Shirley, 2014a), which is often overlooked in UPT literature. This is especially the case for developing countries and metropolitan areas where rapid urban growth and resulting transport problems together with a weak institutional setting make the consideration of institutions indispensable in UPT analysis.

The specific purpose of this paper is to identify and examine the institutional issues in UPT systems from a NIE perspective. The concepts and theories developed within the NIE literature, including transaction costs, agency theory, contracts and property rights

are particularly relevant in that regard since they help conceptualize the interrelated role of organizations as actors within their institutional settings. These actors have interests, incentives, powers, liabilities, and actions which constitute the institutional environment. Asymmetries among the transport actors in terms of power, information and resources should be considered while conceptualizing and examining the institutional environment. Therefore; a general account of actor relations within the public transport field is needed for any institutional analysis so that a robust institutional framework can be developed to mitigate the externalities resulting from those relations. To do this, two main branches of NIE are employed in this paper: the Williamsonian transaction cost economics branch focusing on the structure of governance and organizational arrangements and the Northean institutional analysis branch dealing with the institutional change and institutional environment (Ménard and Shirley, 2014b).

This paper intends to fill an important gap in the literature by exploring the implications of NIE for understanding UPT issues with a concise review of NIE literature, which mainly covers the fundamental issues of NIE. Although there are many studies in the literature addressing public transport issues by partially utilizing NIE-related concepts, theories and approaches; this study is the first attempt to "*systematically and holistically*" analyze and capitalize on the insights provided by NIE. The previous studies draw on agency theory, transaction cost economics and institutional change approaches to illuminate one aspect of a specific urban transport issue. This study not only consolidates the previous literature in UPT and provides an overview but also adds value by discussing the implications of NIE and highlighting the research gaps, aiming to be a literature review paper (Wee and Banister, 2016) in the field of UPT and NIE. Trying to conceptualize the UPT area as an action area and presenting a picture of UPT landscape based on a NIE perspective, this paper attempts to broaden our comprehension of the features, development, and functions of the real world UPT institutions and organizations.

2.2 New Institutional Economics: Theoretical Underpinnings and Empirical Applications

2.2.1 Theoretical underpinnings

Early or old institutional economics, with proponents John Commons, Thorstein Veblen and Daniel Bromley, underline the legal, social and cultural foundations of the economic structures and the evolutionary and habit-based processes by which institutions are established and changed. It was put forward against the individualist assumptions of neoclassical economics. According to old institutional economics, human preferences are determined by institutions rather than individual cognition. However, old institutional economics lacked rigorous and systematic theoretical foundations and concerned more with the description of specific cases. New institutional economics, on the other hand, emerged to fill this gap, integrated the assumptions of neoclassical economics such as "rational economic agent" with the institutional assumptions and sought to explain, rather than describe, the determinants of institutions and examine the institutional change dynamics (Hodgson, 1998).

Although it is hard to pinpoint the exact definition of New Institutional Economics (NIE), its central claims and underpinnings can be propounded with some degree of generality. The central argument of the theories and approaches related with NIE is that institutions matter, and it is worth working through the relationship between institutional structure and the performance of any socio-economic system (Richter, 2005). NIE first emerged when Coase (1937) underlined the importance of transaction costs to analyze the reasons for the existence of the firm. The concept of transaction costs was later applied to various issues of organizational theory (Alchian and Demsetz, 1972). Institutional factors such as property rights and governance structures are endogenized in NIE studies to reduce transaction costs, uncertainties as well as externalities and to increase collective social benefits from coordinated or cooperative actions (Rutherford, 2001). Transaction costs, property rights and contracts are some of the key concepts of NIE. The economics of property rights became the topic of interest in early studies of NIE. The study of Knight (1924) on the social costs of road congestion can be regarded as an early precursor of future NIE studies in the transport field due to its emphasis on property rights arrangements. NIE is distinguished from other economic theories by its emphasis on institutions as rules and norms, its micro-

level analysis of firms and market organizations together with their public policy implications, its dynamic capture of economic evolution which allows for interdisciplinary studies (Ménard and Shirley, 2014a).

Two approaches associated with two key figures stand out within the NIE tradition: Oliver E. Williamson and Douglass C. North. North (1990) develops an analytical framework to explain how institutions and institutional change influence the performance of economies. According to North, institutions, or in other words "institutional environment", constitute the general rules which shape and constrain the actions of the economic actors in individual level as well as organizational level. North's historical perspective in NIE provides an important tool to examine the institutional change processes over time and how this translates into performance outcomes. Belief systems, ideologies, and mental models are important institutional factors in Northean approach (North, 1994). In traditional UPT literature, the effects of these factors on the management of UPT systems have seldom been considered.

Williamson, on the other hand, emphasizes the transaction cost minimization in the selection of a certain governance type (Williamson, 1981). Developing a transaction cost economics (TCE) view of governance structures, he regards the transaction as the central unit of analysis and argues that the comprehension of transaction cost economizing is crucial for the study of organizations by assessing to what degree their governance structures help economize on these transaction costs. Unlike North's emphasis on institutional environment, Williamson focuses on "institutional or organizational arrangements" whereby economic entities structure their activities and carry out transactions according to the rules defined within the institutional environment. TCE tries to respond to the question of whether the market or the firm as a form of production is economically more efficient governance option for a certain transaction. In this sense, TCE logic is quite important in the analysis of government outsourcing (Williamson, 1997). In this paper, Northean and Williamsonian approaches are employed in a complementary manner to illuminate the issues in UPT systems. By this way, the mechanisms through which organizational arrangements including contractual relations in public transport systems are embedded in the institutional environment can be better explored to bridge the gap between those domains.

The term “institutions” come to refer to different meanings in various contexts in the NIE literature. Various definitions in the literature underline different aspects of institutions. However, the concept of rules is central to all definitions. Denzau and North (1994) refer to the rules as “embodied belief systems and norms of individual behavior”. Even though some studies tend to regard organizations as institutions (Linarelli, 2010); organizations are often considered a subset of institutions. In this paper; we adopt a Northean approach to institutions defined as “the formal rule set or rules of the game” (North, 1990), and regard organizations as the players operating under this formal rule set. Since UPT systems are not just technical systems but also socio-political constructs, they are influenced by the institutions of the market and society in which they operate (Curtis and Low, 2016). This political play of power is a kind of game governed and influenced by the institutions. Therefore, Northean understanding of institutions suits our purpose in analyzing the UPT field.

2.2.2 Empirical applications

NIE-related approaches have been utilized in understanding the features and development of institutions and its effect on economic performance in various countries, sectors, markets, and organizations. Although there are many studies using an institutional analysis approach in transport studies (Gwilliam, 1979; Rietveld and Stough, 2004; Haynes et al., 2005) and urban transport studies (Macário, 2007; Low and Astle, 2009; Stone, 2014); these studies do not employ a specifically NIE perspective in their analysis. These studies tend to regard institutions as the organizations managing transport or urban transport sector. The most widespread conception of institutions as “the rules of the game” is lacking in those studies. The only study, to our knowledge, having a specific NIE orientation in transport studies is a study by Groenewegen and De Jong (2008) which tries to explain the institutional change in the construction and maintenance of transport infrastructure in the context of liberalization in Nordic countries. In addition to this study, Button (2010) refers to NIE, though not in a detailed manner, in his book “Transport Economics”, when explaining the institutional structures.

The lack of NIE-oriented studies in the analysis of UPT does not mean that the concepts related to NIE are not used. For example, transaction cost economics and agency theory are utilized in the literature, which will be extensively examined in

Chapter 4 and 5 of the thesis. However, these studies do not aim to base their research on the conceptual foundation of NIE. They generally use these concepts to partially support their arguments. The fact that NIE has not attracted much attention in UPT studies is not surprising when we think of the compartmentalization tendency in transport studies and NIE as a multidisciplinary perspective incorporating such disciplines as economics, political science, sociology, organization theory, management, and law.

2.2.3 An institutional framework for urban public transport

Williamson (1998) proposes four levels of social analysis to analyze the economics of institutions. His schematization of these levels is useful for conceptualizing and positioning the institutional environment for any organizational field, including UPT systems. The transactional relationships between transport actors in any public transport system occur not in a vacuum, but in a particular institutional environment. Figure 2.1 shows the institutional levels of UPT systems, constructed by adapting Williamson's illustration of the economics of institutions diagram.

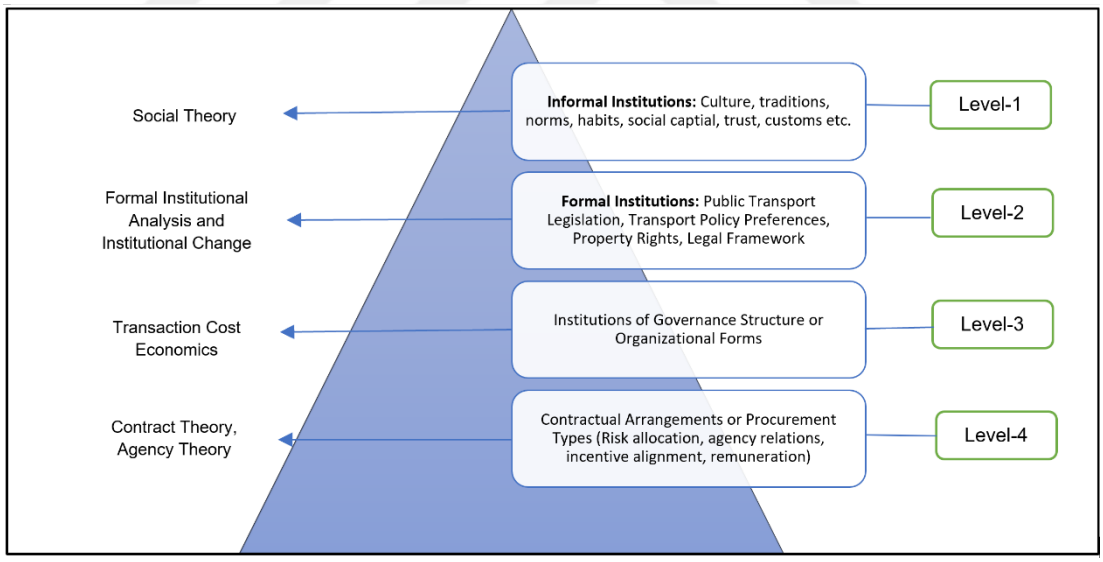


Figure 2.1 : Institutional levels in UPT, adapted from Williamson (1998).

The higher levels in the institutional pyramid influence and constrain the lower levels, and the lower levels give feedback to the higher levels. Although NIE has been mainly concerned with levels 2 and 3 (Williamson, 2000), levels 1 and 4 are not totally outside the domain of NIE-based approaches. Formal institutions are socially embedded in informal institutions such as culture, norms, and customs. Similarly, contractual arrangements cannot be totally separated from governance structures or organizational

forms. Williamson refers to level 2 as the institutional environment, while levels 3 and 4 include institutional or organizational arrangements where actors structure their behavior and transactions among them occur as prescribed by the rules defined in level 2.

In the following sections, the main theories and approaches in NIE are reviewed for each institutional level one by one with a view to accommodating them for UPT field. The Northean approach is drawn on for the institutional levels 1-2 where informal and formal institutional levels and institutional change dynamics are examined, whereas Williamsonian approach is utilized for the institutional levels 3-4 which covers the governance structures and contractual arrangements.

2.3 Informal Institutions

The first institutional level deals with the informal institutions, an area which is often downplayed in UPT studies. Informal institutions include elements such as social capital, trust, culture, norms, routines, traditions, customs, and habits. Informal institutions take a long time to change; therefore, require long-term planning approaches. The economic actions of the actors together with the formal institutions are all embedded in informal institutions (Granovetter, 1985). Trusting partnership, for example, is a newly emerging type of contracting between transport operators and authorities, which try to capitalize on the level of trust (Stanley and Hensher, 2008). Habits and customs shape the passengers' transport behaviors to a large degree, apart from economic considerations. Social theory is an appropriate methodological tool to develop theoretical frameworks to describe, examine and analyze the phenomena at this level.

Social networks having informal institutions such as norms and trust facilitate economic exchange where formal institutions have limited ability (Granovetter, 1985). Informal contracting mechanisms like relational governance have some advantages over formal contracting mechanisms (Zenger et al., 2000). Long-term relationships among various actors lead to an increased cooperation and trust level; and an idiosyncratic culture, routines, customs, and habits develop over time. Social capital includes tacit knowledge, which develops through the relations between actors and tasks over time which is hard to codify, transfer or write down. Paratransit informal operators in most developing countries, for example, exhibit properties of social

networks having its unique working culture, norms and routines in the way transport services are provided. In weak institutional environments, informal institutions may help promote good governance practices. Similarly, in weak UPT settings where formal transport modes fail to adequately deliver service provision, informal paratransit modes of transport fill an important gap. Collective action is also facilitated or hampered by the degree of social capital an actor group has. In many Indian cities, for example, informal transport modes such as rickshaws and casual carpooling systems fill an important gap left by uncoordinated, disconnected and inadequate formal bus and rail modes (Pojani and Stead, 2017). Even though they provide flexibility and first and last mile connectivity, the regulatory environment in which they are operating is often ambiguous. This ambiguity of the rules and norms in such an informal environment might lead to a lower service quality.

Community transport systems are another good example of how social capital, an important element of informal institutions, can positively contribute to the provision of transport services, especially for excluded social groups which have poor access to formal public transport modes such as financially disadvantaged, disabled or the elderly (Gray et al., 2006). For example, Sheffield Community Transport is a non-governmental organization which provides charitable community transport services in Sheffield, UK and funded by several trusts. However, the effectiveness of such schemes is dependent on the level of social capital along with other informal institutions such as social networks, norms, values, and trust.

Transport demand management (TDM) schemes provide useful policy tools to change the demand dynamics and travel behavior of people, hence reduce or relocate the travel demand. Understanding the role of informal institutions such as travel habits, culture and norms is critical to figure out the effectiveness of TDM policies in changing behavior. Therefore, the NIE approach can provide a broader conceptualization of proposed TDM policies and underlines the dynamic interaction between first and second institutional levels, which correspond to the informal institutions and transport policies, respectively.

When we review the literature regarding the role of informal institutions in UPT, main issues which have been addressed so far mainly include the role of trust in partnerships (Sørensen and Longva, 2011), relational contracting (Stanley and Van de Velde, 2008) and the relationships between formal and informal institutions in public transport

(Hrelja et al., 2017). The issue of routines and habits in urban transport travel behavior and mode choice has been covered extensively in the literature (Van Acker et al.,2010; Schwanen et al.,2012). The collection of articles within the book "*Transport Systems of Russian Cities: Ongoing Transformations*" (Blinkin and Knocheva, 2016) adopts a clear institutional perspective in their examination of Russian urban transport systems. Included in this book, the paper of Vorobyev et al., (2016) is particularly remarkable in its explicit expounding of informal institutions in UPT. It refers to "ideas, norms, cultural conventions and cognitive frames" in shaping the behaviors of transport actors. It also examines in detail how the main actors in UPT and their interests shape the way UPT systems are designed and organized.

Studies examining the role of informal institutions in UPT are still in their infancy. Although the examination of the role of trust in contracts and especially novel contracting types such as relational contracting have been well covered so far, there is still room for analyzing the role of trust between transport actors, other than authority-operator relations. For example, the role of trust and cooperation among transport operators, between operators and passengers and between authority and passengers in performance outcomes present interesting areas of research. To create an efficient as well as an integrated UPT system, the issue of designing an institutional environment where trust and cooperation between the operators and authorities, competition between transport operators and collaboration of all actors are ensured is critical. Considering the informal institutions through an NIE perspective can inform this discussion. The role of social capital and social networks have not been adequately covered in the literature. This issue can be illuminating in understanding the associations of operators especially in developing cities. Social capital can alleviate the collective action problems (Ostrom, 2007). Social capital including norms, trust, and networks can fill the gap left by the formal institutions in developing countries. Operationalization of these factors in UPT remains still unexamined. Uncovering the effect of informal institutions will provide a broader framework for researchers to interpret the performance differences between different UPT systems, beyond simply comparing the key performance indicators of these systems.

2.4 Formal Institutions or Institutional Environment

Formal institutions constitute the rules of the game, or the institutional environment (Williamson, 2000), covering the bureaucratic, legal and political rules and regulations. To analyze the formal institutional elements comprising this institutional level, one should focus on these rules as well as how these rules shape and influence the actions and behaviors of the actors. To give an example from property rights which is part of the legal environment, public ownership of assets brings about different incentives than private ownership (Alchian and Demsetz, 1973), having significant cost efficiency implications. The effect of public or private ownership of operations on performance outcomes is also dependent on the features of the institutional setting. Potential high agency costs between the private operators and public authorities, for example, negatively influence both cost efficiency as well as network effectiveness outcomes for the privately-owned operations. Agency costs are higher when the level of trust and cooperative culture, which are the elements of the informal institutional environment, is not adequate to counterbalance the effect of divergent motives displayed by the public authorities and the profit-seeking private operators. Besides the ownership forms, policy preferences and resulting regulatory reforms also change the way that the actors relate to each other. Regulation and deregulation trends change the way an industry is organized.

Unstable political institutions in developing countries play an important factor in the UPT performance. Institutional change in this level can be directed and orchestrated by policymakers, the outcomes of which can be observed in a shorter period of time compared to the change in level 1. Level of competition, market entry, and exit conditions, public or private ownership are all important formal institutional elements which substantially affect the performance of UPT systems. How market entry and exit conditions affect the service performance outcomes depends on the characteristics of the institutional environment. In an institutional setting where the rules of competition are not well defined or mature enough, and so the market is open to collusions and oligopolistic market arrangements, then strict barriers to market entry and exit are likely to lead to negative performance outcomes. The problem can be aggravated by the lack of cooperation and trust among the transport authorities and operators, the informal institutions which can potentially offset the lack of effective formal institutions.

The institutional environment might contain conflicting rules thereby actors are trapped in "institutional swamps" (Olthaar et al., 2017). To design an institutional environment where the rules are consistent and compatible with each other is crucially important for the effective functioning of UPT systems. In such an institutional fabric, actors can anticipate the outcomes of their actions together with the environmental responses and adjust their behaviors accordingly. On the contrary, in an institutional setting where different formal institutional elements require conflicting responses from the actors, the performance of this system is likely to be lower than the former one due to additional transaction costs for resolving such institutional dilemmas. On the other hand, a well-structured formal institutional environment can boost the effectiveness of transport policies by creating synergies among those policies. This is particularly important for policy packaging, the effectiveness of which is dependent on the implementation context (Givoni, 2014). NIE provides a broader understanding of the institutional context where the transport policies are embedded and implemented, hence increasing the chance of successful policy packaging implementations.

The most widely covered issues in the formal institutional level are regulations and ownership issues and how they shape the UPT policies and outcomes. Pucher (1995) comparatively analyzes government policies regarding the UPT in US and Europe by taking into account the ownership structure (public or private), public regulation, financing arrangements and compares the costs and productivity in two papers. The issue of public or private ownership on technical efficiency of the urban transport sector has been widely discussed (Pina and Torres, 2001), underlining the role of contestable markets for positive outcomes such as high technical efficiency. Gwilliam (2008) propounds the idea of the regulatory cycles where regulation and deregulation attempts alternate, and the role of public and private sector stabilizes in the long run, focusing on the institutional environments in developing as well as developed countries. NIE, through property rights economics perspective, provides a theoretical perspective to frame this discussion. For example, the efficiency of competitive tendering as a procurement model depends on clearly defining and assigning the property rights of assets such as routes, bus stops, interchange stations. Besides cost efficiency, weak property rights also have implications for service quality. For example, paratransit minibus operators in Istanbul cause considerably low levels of

service quality in terms of safety, reliability, and convenience due to a weak assignment of the property rights for the minibus routes (Akyuz, 2015).

Estache and Gómez (2005) add to the ownership and liberalization literature in public transport policy by focusing on market failures and regulatory intervention mechanisms, the effectiveness of which can be regarded as a sign of the strength of formal institutional environment. Wallis and Hensher (2005) draw attention to the effect of the regulatory framework on the success and failure of competitive tendering, which supports our argument that higher institutional levels influence the effectiveness of lower ones. A substantial body of literature in this area can be found in the Thredbo conference series, named "International Conference on Competition and Ownership in Land Passenger Transport". The journal of "Research in Transportation Economics" publishes selected papers from the conference, dedicating a special issue for Thredbo conference papers. NIE perspective has the potential to contribute to this literature with a broader institutional perspective which can account for the contextual local differences in a variety of institutional settings.

The change in a political landscape is one of the most significant factors affecting the formal institutional environment. The market integration of EU countries and the need for reducing public budgets and subsidies, for example, have brought about a change in policies opting for franchising as a form of public transport delivery (Andersen, 1992). Another study on the institutional evolution of the urban transport market from a more theoretical perspective comes from Macário (2005). She focuses on the relationship between regulations and institutional behavior, bringing a system dynamics and complexity perspective to the study of the formal institutional framework. Low and Astle (2009) contribute to the literature of formal institutions by tracing the evolution of urban passenger institutions in Melbourne, Australia spanning a very broad time horizon from 1956 to 2006. They explore the implications of path dependence and compare the interaction between road planning and public transport planning institutions. There are also studies in the UPT literature addressing how to develop effective regulatory frameworks for sustainable UPT systems in developing countries. Sohail et al. (2006) underline the importance of close collaboration between transport actors, including regulators, operators, and passengers for the effectiveness of regulatory measures, suggesting self-regulatory measures based on the participation of all transport actors.

An institutional view of UPT can illuminate the institutional change dynamics involved in the long-term transformations. For example, the development of competitive tendering as a procurement model in public transport cannot be fully understood without considering the broader shifts in economic interest towards deregulation and privatization beginning around the 1980s. EU Regulation 1370 /07 for public transport passenger services to foster competition in procurement came later as part of the new formal institutional environment. Public service obligations (PSOs) are defined during the implementation of those regulations and policies to avoid the conflict of commercial interests with social interests, leading to some transaction costs in the form of enforcement and monitoring costs between regulators/authorities and operators. This is one example of how broader institutional change dynamics influence the structuring of the lower institutional levels.

Although the formal institutional level is widely covered in the UPT literature with extensive discussions about regulations, ownership structures, market failures, legislative changes, property rights of transport actors and policy changes, there are still potentially new areas to explore from a new institutional economics perspective. The dynamics of institutional change have been paid little attention together with the interplay of the formal institutional level with other institutional levels. Designing a consistent formal institutional environment where institutional elements do not overrule one another is still an area to be explored in detail. Institutions are also key elements of the "socio-technical regime" in UPT systems. Formulating policies for the transition to a more sustainable urban transport future involves examining the linkages between the proposed transport policies and current institutions and NIE, through institutional change approach, can help better understand those transition dynamics.

2.5 Governance Structures and Organizational Forms from Transaction Cost Economics Perspective

The third institutional level is the level of governance structures and organizational forms. Selecting an appropriate governance structure and associated organizational form is key to reduce the transaction costs among the transport actors. The governance structures in UPT include in-house municipal operations, contracting (route or network) and free-market initiative, in some cases, with additional contracting (Van de Velde et al., 2008). Transaction cost economics (TCE) is used to examine the

efficiency of transactions taking place in a particular governance structure. TCE approach provides an important perspective, to better illuminate the characteristics of the transactions taking place between public transport operators and authorities. Whether to introduce contracting to private transport operators or stay with in-house municipal operations is a policy decision which can be settled by including transaction cost considerations. Yvrande-Billion (2006) uses the TCE framework to assess the expected and realized results of contracting and explains the observed differences. Evaluating the effectiveness of a certain governance structure requires the analysis of transaction costs, inherent in the relationship.

Even though a formal institutional environment is well-structured, without a transaction cost economizing governance structure the efficient realization of policy objectives is hampered. This institutional level concerns itself with structuring and aligning the relationships among the actors by choosing an appropriate form of organization. TCE is one of the theories within the NIE literature which is used in the analysis of this institutional level. Apart from TCE, the adaptive governance approach (Dietz, 2003) along with the game-theoretic and evolutionary approaches (Ostrom, 1990; Nelson and Winter, 2002) are used, particularly for the governance of common-pool resources. Considering public transport as a common pool resource (Glover, 2012), those approaches are also helpful in organizing effective governance structures for the management of UPT systems.

Although organization and governance issues are widely covered in UPT literature, transaction cost perspective is rarely utilized in understanding why these specific organizational forms have been selected or which forms are more efficient and appropriate. The relationship between structural forms of urban public transport and performance together with the issue of organizational change is examined by Costa (1996), without transaction cost perspective. On the other hand, the transaction cost approach has been widely employed without its implications on governance and organization. For example, the study of Wegelin and von Arx (2016) analyzes the transaction costs of different governance forms, namely competitive tendering in Germany and direct awarding in Switzerland, in rail public transport with implications on arguments for or against the competition. Canonico et al. (2013) analyze the alignment between transaction dimensions and governance structures in Italian public transport systems from a TCE perspective. Big and Rosell (2016) study the transaction

costs of public and private firms within the urban bus system in Barcelona. The costs of vertical integration and vertical separation have been examined from a transaction cost perspective extensively in rail public transport systems (Mizutani et al., 2015; Merkert et al., 2012). However, in public bus operations, transaction cost perspective has not been utilized as widely as that of rail operations. This is understandable when we think of the much higher transaction costs involved in rail operations due to the high asset-specific investments.

Institutions facilitating lower transaction costs are crucial in terms of service quality outcomes as well as cost efficiency implications especially when contracting or competitive tendering is used as a procurement model. The measurement difficulties of the performance of an operator, one of the important constituents of the transaction costs, negatively influence the service quality outcomes. This is especially the case for the performance-based contracts where the remuneration is tied to the service performance outcomes such as ridership, reliability, and safety. TCE draws attention to search and information costs, bargaining costs and enforcement costs which are especially critical for competitively tendered public transport operations.

The indirect results of a well-structured institutional setting include ridership growth, better service design and service quality and, most importantly, cost efficiency. TCE, for example, helps reduce the costs associated with the transaction costs between the transport authorities and operators. Service planning functions such as scheduling, network planning, and station/stop planning are carried out by either the transport operators or the authorities. The effectiveness of these functions, when undertaken by either one of them, can be better understood with a TCE approach. Scheduling, for example, can be delegated to transport operators when transaction costs of authority-operator relations are low.

NIE, particularly through transaction cost economics (TCE) approach, can help better understand under which institutional circumstances deregulated models are more appropriate in terms of service effectiveness and cost efficiency. The decision of when to choose deregulation or competitive tendering as a governance model is influenced by the institutional features (Canıtez and Çelebi, 2018). In an institutional environment where the transaction costs between the transport operators and authorities are high due to high uncertainty, asset-specificity or frequency of relationships, market-based provision models (e.g. deregulated market models or competitive tendering) are less

transactionally cost-economizing. In this case, negotiated contracts or direct in-house provision models are more suitable. More generally, considering transition costs with a TCE approach for the selection of governance models offers a better cost-economizing way.

Because of the differences in bus and rail transaction costs, separately seeking out the implications of transaction costs on governance structures is recommended. The literature still lacks a comprehensive understanding of transaction costs and governance structures in the organization of public bus operations. Another deficiency is the relationship between the institutional environment and transaction costs. A well-designed institutional environment potentially reduces transaction costs by delineating the monitoring and enforcement rules in a clearer manner. Although TCE perspective has been widely used in operator-authority relations, an interesting research area might be the examination of passenger and authority relations. The identification of organizational forms through which the transaction costs of channeling passenger demands and interests are minimized is a problem area waiting to be explored. A comparative analysis of centralized transport authorities with decentralized fragmented governance forms in terms of their transaction cost implications is a topic that can be addressed via a TCE perspective.

The integration between land use and transport is important for sustainable urban development (Geerlings and Stead, 2003). Both policy integration (second institutional level) and governance integration (third institutional level) is crucial to realize the expected benefits of this integration. The compatibility of the policies influencing the UPT area is an integral element of a strong formal institutional setting. The fragmentation in the management and governance of land use and transport is a major problem, especially in developing countries. NIE provides a broader institutional framework to address both policy and governance aspects of land use and transport integration. For example, integration in governance on its own without integrating the policies at higher scales is not sufficient to ensure a full-fledged integration.

2.6 Contractual Arrangements from Agency Theory and Contract Theory Perspectives

Designing effective contractual arrangements where risks are allocated optimally and incentives are established to align with the conflicting interests is the main objective

of the last institutional level. Here two theories from NIE literature stand out: contract theory and agency theory. Contracts being imperfect and incomplete are the two basic assumptions which are critical to NIE (Ménard and Shirley, 2014b). Contracts are unavoidably incomplete due to bounded rationality (Williamson, 2000). It is not possible to foresee all future contingencies. Incompleteness of contracts, when combined with other problems such as opportunism, adverse selection, and moral hazard, pose serious problems for the credibility of the markets. Elimination of these contractual hazards is the objective of the attempts at this institutional level. Procurement types in UPT including direct awarding, competitive tendering, negotiated performance-based contracts are arranged at this level. Remuneration models such as gross-cost, net-cost or incentive-based (Stanley and Van de Velde, 2008) are selected so that incentives are properly set, risks are distributed, and agency costs are mitigated.

Agency relations between transport authorities, operators and passengers occur at this level, with different risk allocation and incentive alignment outcomes. Consideration of Principal-Agent relations between regulators and operators through an agency theory approach helps designing contracts that are effective in combating contractual hazards. Almost all contractual arrangements contain elements of agency. In planning UPT services, NIE also helps overcome the limitations of neoclassical outlook by taking into account the asymmetric information, bounded rationality and vested interests of the transport actors. This is especially important when planning the functions of transport operators and authorities.

Approaches based on agency theory are also utilized in the UPT literature. Authority operator relations are examined through agency theory by Pilar and Rus (2010) in Spanish urban transport contracts. Other studies include traveler mode-choice problems (Anwar, 2016), the role of social networks and moral hazard in the taxi industry (Schneider, 2010). Overall, this institutional level seems to be the most extensively researched institutional level together with the formal institutional environment level.

Concerns with asymmetric information, moral hazard, adverse selection, opportunism, principal-agent relationships should be addressed at this level. Agency theory provides a useful methodological tool to analyze the principal-agent relations between transport

actors, including authorities, operators, and passengers. Figure 2.2 illustrates the relationships between those main transport actors:

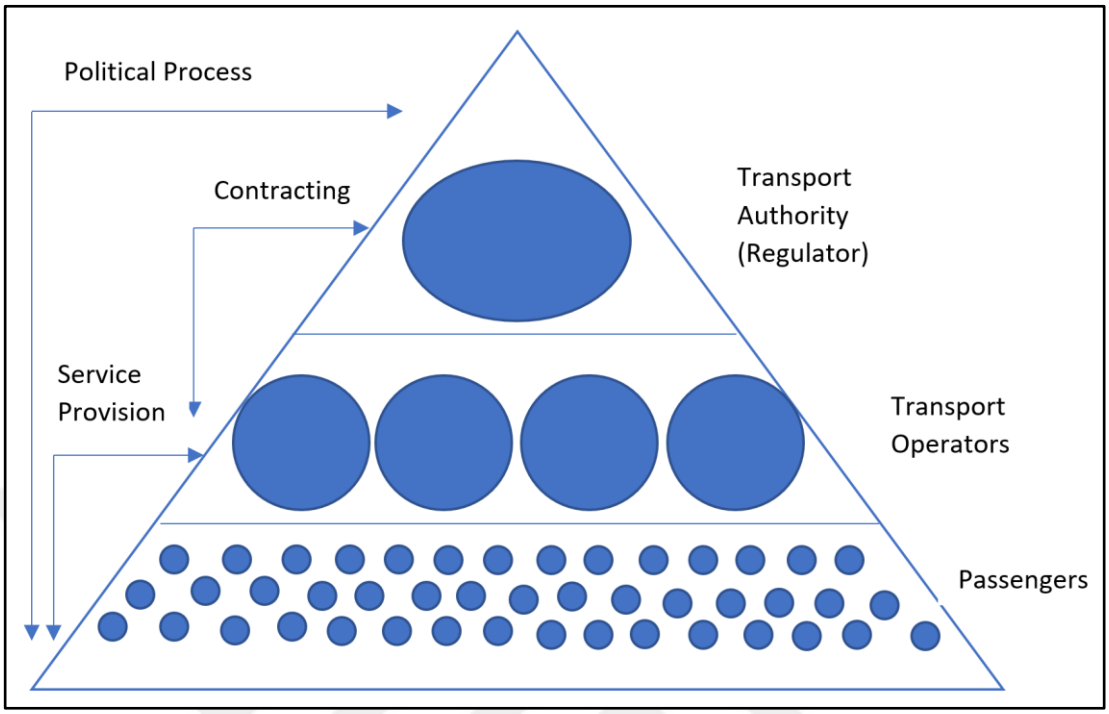


Figure 2.2 : Main transport actors in UPT systems.

The illustration in Figure 2.2 shows the main transport actors together with their relative powers and the type of relations among them. The size of spheres illustrates the relative power of the actors. Transport authorities or regulators are the most powerful actors of the UPT field. Transport authorities have a contractual relationship with transport operators, delegating the liability of transport provision to them. This makes transport authorities “Principal”, and transport operators, “Agents”, in agency theory terms. Passengers, individually, have the least degree of power; however, acting collectively, they elect the local government, who in turn appoints the board of directors of transport authorities. Conceptualizing the relative power in these terms facilitate our understanding of many problems, arising from the agency relations between actors.

NIE can provide a conceptual backdrop for the contract design process where the behaviors, motivations, and interests of the actors involved are taken into consideration. Contract design elements are decided with different effects on incentives and risks. Even though the assumptions of neoclassical economics are applied at this level, the higher institutional factors such as the regulatory environment or governance structure influence and shape the actors’ behaviors. The consideration

of this level as embedded in the higher institutional levels can help explain the performance differences among different urban areas, or cities, having different institutional arrangements. The same contract can result in different performance outcomes in different institutional settings. Hence, recourse to higher institutional levels can facilitate explaining the factors leading to those performance differences.

There is a broad literature in UPT covering the issue of contracting (Pedro and Macário, 2016; Veeneman and Smith, 2016). The notion of incomplete contracts is examined by Yvrande-Billion (2006) in public transport contracts. Hensher and Stanley (2010) suggest a performance-based negotiation contract to eliminate contractual hazards in competitive tendering. The positive service quality outcomes of the tactical level trusting partnerships (Stanley et al., 2007) depend on the critical role of informal institutions such as trust, a disciplined and cooperative partnership culture between the operators and authorities. The bus services in Melbourne, Australia where a tactical level trusting partnership is implemented provides a case for increased service quality performance indicators, including patronage growth, the timeliness of service provision and customer satisfaction (Stanley and Hensher, 2008).

Although research gaps within contractual relations have been quickly filled by new studies, what is lacking in those studies is an institutional outlook encompassing different institutional levels together. The effect of formal or informal institutional arrangements on contracting, for instance, brings a more dynamic perspective to NIE studies in UPT. Design of contracts can vary depending on the broader institutional environment. In an institutional setting where trust is high, and actors share a collaborative culture, one expects a more negotiation-based contracting. Empirical studies can confirm the validity of this argument. How different formal institutional elements such as ownership structure, regulatory environment, financing arrangements influence the contractual arrangements can be explored by further studies. Implications of agency theory, on the other hand, can be further sought out through the analysis of different urban transport actors besides operator-regulator relations. Passengers and regulators are also related to each other through an agency relation, where passengers are “principals”, and regulators are “agents”. The democratic political processes guiding this relationship is a potentially new area to study.

3. ESTABLISHING A METROPOLITAN TRANSPORT AUTHORITY IN ISTANBUL: AN INSTITUTIONAL FRAMEWORK[2]

3.1 Introduction

Urban mobility systems are core components of urban systems. Like all socio-economic systems, an urban transport system is embedded within an institutional environment. It is also comprised of many components, the interactions of which determine the system performance (Macário, 2011a). Effective management and organization of urban transport systems require a holistic perspective which takes into account not only the actors comprising the overall system, but also their roles, interrelationships, functions as well as their interests, conflicts, demands and motivations. A contextual approach where each transport actor or component is conceptualized with its role and function within the broader environment is needed to address the urban transport issues and improve the system as a whole. Urban transport systems are not only comprised of public transport systems, but they also include traffic management, services and infrastructure all of which ensure the satisfaction of citizens' mobility demands (Macário, 2011b). Therefore, a framework to facilitate the conceptualization of the entire urban transport as a system integrated with its constituent parts and embedded within the institutional environment is needed. Such a framework provides a holistic perspective to analyze and contextualize the problems, to identify the improvement areas and to propose institutional change and reform initiatives.

"New Institutional Economics" (NIE) perspective potentially provides a holistic framework for understanding the institutional environment along with institutional change in urban transport systems. Defined as "the rules of the game" (North, 1990),

[2] This chapter is based on the manuscript "Beyazıt, E., Canitez, F, Çelebi, D. (2018). Establishing a Metropolitan Transport Authority in Istanbul: A New Institutional Economics Framework for Institutional Change in Urban Transport".

institutions shape the context and set the rules, both formal and informal, by which urban transport entities and components interact with each other. Due to integration, complementarity and interdependence between urban transport elements (Macário, 2004; May et al., 2006), an institutional framework can delineating the roles, incentives and liabilities of these elements. NIE is the body of literature which addresses the institutions and the institutional environment characterizing those rules within which organizations and markets operate (Ménard, 1995). NIE includes various economic theories and approaches such as transaction cost economics, the principal-agent approach (agency theory), contract theory, property rights economics (Williamson, 2000). The main argument of NIE is that institutions matter, and they influence the performance of any socio-economic system (Richter, 2005; Furubotn and Richter, 2005). Other theoretical assumptions include positive transaction costs, incomplete contracts, asymmetric and costly information and imperfect property rights (Ménard and Shirley, 2014). Furthermore, North (1990) develops an analytical framework to analyze how institutional change influences the performance of economies, bringing a historical and evolutionary perspective.

The purpose of this section is to propose an institutional change framework in urban transport by drawing from NIE and implement this framework to examine the institutional environment of Istanbul's urban transport system and propose an institutional change roadmap. Istanbul, with its population reaching up to 15 million, is the largest metropolitan area of Turkey and it can be regarded as the economic, cultural, and historical center of the country. However, rapid population growth from 4.7 million in 1980 to 14.8 million in 2016 (TSI, 2016a) has brought about a huge increase in urban transport demand. Although major urban transport investments in the form of new underground and bus rapid transport (BRT) projects as well as an increase in the provision of bus, ferry and paratransit services have tried to keep pace with rapid urban transport demand (Gerçek et al., 2004), the fragmentation in the management and governance of those services has prevented the city from capitalizing on the integration benefits of those services. This fragmentation in governance coupled with the lack of a robust institutional environment and a consistent formal institutional framework has aggravated the urban mobility problems.

To address the deterioration of urban transport, Istanbul Metropolitan Municipality (IMM), the local government of Istanbul, and IETT, Istanbul's municipal public bus

operator, initiated a project to set up a metropolitan transport authority (MTA) in 2015. The efforts and attempts for centralized governance of urban transport go back to 2004. After such a long period of time, there has not been any major institutional change in formal institutional environment and governance of urban transport. In this paper, Istanbul's attempt to set up a MTA is analyzed by using the proposed institutional change framework. In addition to this, the institutional environment is examined, the reasons for setbacks are elaborated, the challenges are highlighted, and a new institutional change roadmap is proposed. This paper provides a theoretical as well as a practical assessment of the issue of the institutional environment and institutional change, using Istanbul's urban transport system as a case example. With this study, we aim to contribute to the extant literature in two ways: i) developing a framework to analyze the institutional environment of an urban transport system to facilitate institutional change initiatives, ii) applying this framework to examine the institutional environment of Istanbul's urban transport system and propose a roadmap for institutional change.

3.2 Developing an Institutional Change Framework

Although NIE approach has been used in many sectors and policy areas, urban transport is a policy area where NIE perspective is seldom used to analyze the institutional environment and governance mechanisms. There are two main branches in NIE (Ménard, 2014). The first one is associated with Oliver Williamson, where governance mechanisms are explained by their role in economizing on transaction costs (Williamson, 1979, 1981, 1989, 1998). This approach is particularly useful in analyzing the governance structure of urban transport systems with respect to their role in reducing the transaction costs. The second branch, associated with Douglass North, focuses on the dynamics of institutional change and the institutional environment, or formal institutions, which shape and constrain the behavior and incentives of the economic actors (North, 1971, 1990, 1994, 2008). This perspective is useful in examining the formal institutions, in other words, institutional environment, of urban transport systems. Formal institutions include legislation, property rights, contract

laws, legal framework and bureaucratic functions of government and the power distribution among different levels of government (Williamson, 2000).

Williamson's (2000) framework to analyze the economics of institutions provides a good illustration of the institutional setting in which organizations are embedded. Canitez and Celebi (2018) adapted this framework for urban public transport environment, as can be seen in Figure 3.1:

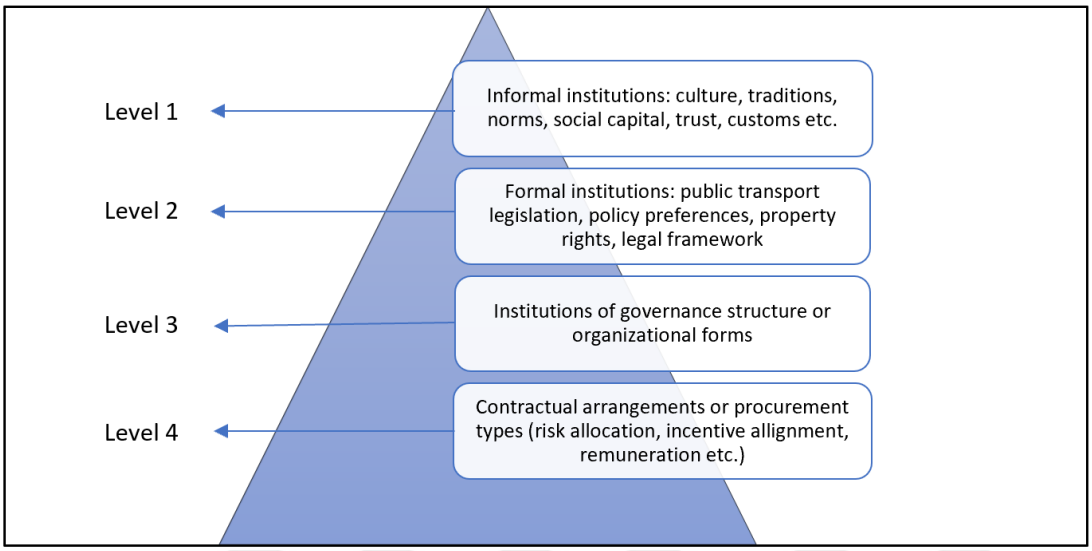


Figure 3.1 : Economics of institutions in public transport systems (Adapted from Willimson, 2000).

This first institutional level refers to the informal institutional elements such as culture, traditions, norms, social capital, trust and customs. The second level is about formal institutions, or institutional environment, and the third level is concerned with the governance structure or organizational forms in urban transport systems, both of which are the main focus of this paper. The last level examines the contractual arrangements including procurement models underlining the role of risk and incentives between the transport actors. In this paper, the role of the institutional environment (Level 2) and the institutions of governance structure (Level 3) are examined. In fact, NIE has been mainly concerned with those two levels (Williamson, 2000). The interplay of these levels with other levels (Level 1 and 4) is also discussed in the paper.

According to Williamson (2000), "*the higher (institutional) level imposes constraints on the level immediately below…and the system is fully interconnected*". Hence, institutional change attempts where an institutional element in a lower institutional level is sought to be improved without an amendment in the institutional elements of

the upper institutional level are likely to fail. For example, policy changes attempting to increase the use of public transport to bring about a sustainable mobility paradigm (Level 2) (Banister, 2008) are less effective without fostering a culture of sustainability in transport planning (Level 1). Similarly, changing the governance structure of urban transport systems (Level 3) is likely to fail when there is not any change in urban transport legislation which delineates the roles and functions of urban transport actors (Level 2). Although this might seem obvious for developed institutional settings where rules are clearly defined, in less developed institutional settings rules are not so clear to guide institutional reform initiatives. The reforms carried out in such settings often lead to conflicting or inconsistent institutional elements.

We propose the following framework in Figure 3.2 for institutional change or reform initiatives:

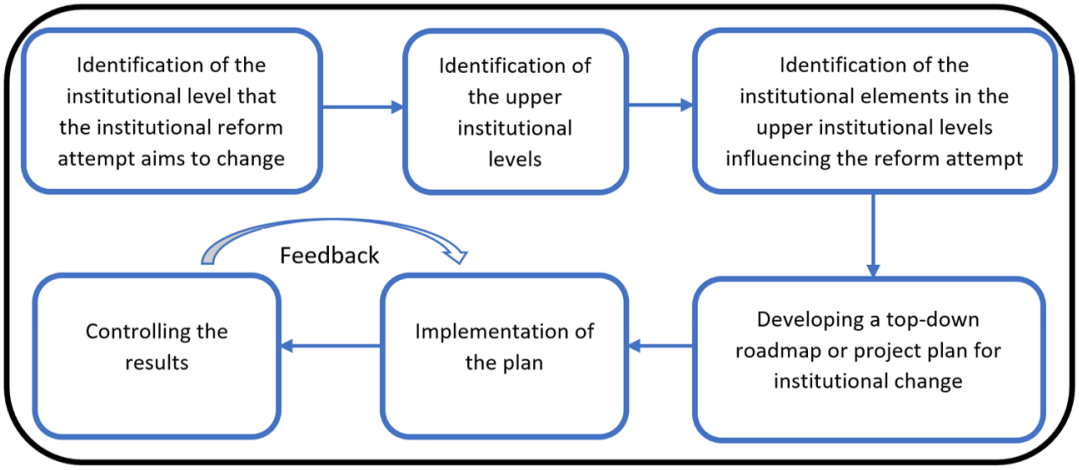


Figure 3.2 : Institutional change framework.

This institutional change framework, as shown in Figure 3.2, is only helpful after constructing the institutional pyramid presented in Figure 3.1. Therefore, both frameworks should be used together to guide the institutional reform initiatives. First, institutional reformers should consider the institutional setting with all the institutional levels and elements in those levels. Then, they should identify the institutional level which includes the institutional element that the reformers are aiming to change. Then, the upper institutional level is identified and together with the institutional elements in this level which influence, constrain or frame the institutional reform change attempt. After this identification process, reformers should develop a top-down roadmap or project plan which includes elements of feedback mechanism to avoid any unintended

consequence. The rest is implementation and monitoring of the change/reform/transformation process.

3.3 Methodology

In this section, the project of transitioning to a centralized metropolitan transport authority (MTA) governance model from fragmented governance model in Istanbul's urban transport management is examined as a case study which aims to provide an empirical assessment of the institutional change framework developed above. The case study is considered an appropriate methodology for this paper because above all, it allows the researchers to study complex phenomena within their contexts (Baxter and Jack, 2008). Moreover, Ménard and Shirley (2014) underline the openness of NIE for case studies due to its dynamic, complex and interdisciplinary nature. Since the institutional change attempt in Istanbul to set up a MTA involves a highly complicated web of interrelationships with various contextual elements, the examination of this process from a NIE perspective makes case study methodology quite appropriate. On the other hand, case study methodology is also helpful in developing and evaluating theories, examining various relations among the elements within a system, proposing policy reforms and studying institutional change (Alston, 2008). Yin (2009) also points out that the case study approach helps the researcher to explore actors and organizations, complex interventions, relationships, policies and programs, all of which are part of this study.

Istanbul's project case of the establishment of a MTA presents a good testing field of the proposed institutional change framework. Rather than constructing a theory out of the case study itself (Eisenhardt, 1989), in this paper, we aim to support, ground and justify the validity of our framework through the case at hand. Data and information regarding the case of Istanbul is collected through the project documents, organizational sources, workshop minutes, in-depth interviews with managers of the project as well as the key experts from various transport departments. The main participants of the project include IMM, IETT and a private consulting company. The 2nd and 3rd institutional levels are closely examined because establishing a MTA directly involves these levels.

3.4 Case Study

Istanbul is a good example of a metropolitan city where a fragmented institutional setting for the management and organization of urban transport systems leads to growing urban transport problems. A comprehensive analysis of the institutional environment with a view to elucidating the dynamics of urban transport system is needed to contextualize those problems. In this section, firstly, a general overview of the governance structure of the urban transport system is given and the relevant transport actors in Istanbul are examined in terms of their conflictual roles to show the institutional fragmentation. Secondly, the institutional environment is analyzed and its relationship with other institutional levels is discussed. Lastly, the institutional change attempt to set up a MTA is examined in light of the institutional change framework we developed in the previous chapter.

The main information sources are provided by the two key entities responsible for the management of the urban transport in Istanbul: IETT and IMM. The Strategy Development Department and Transport Planning Department in IETT provided us with the monthly and annual performance reports, annual customer satisfaction survey results, strategy plans set out for the coming 5 years and statistical reports. Whereas these sources mainly constitute the operational analysis of our analysis, the documents provided by IMM such as Transport Master Plan, annual travel surveys which include all modes of transport and investment plans gave a more strategic outlook for the management of urban transport in Istanbul. Besides published materials, the most supportive source for our analysis came from the interviews we had with the key transport actors. Semi-structured interviews are conducted with IETT and IMM directors and planners who are responsible for strategy devleopment and planning between April and June in 2018:

3.4.1 General overview: main actors and governance structure

Istanbul is at the crossroads of transcontinental transit corridors as it connects Europe and Asia through the three bridges crossing over the Bosphorus and a rail tube tunnel under Bosphorus, called Marmaray. Istanbul has a relatively well integrated public transport system. The public transport services include public buses, a bus rapid transit (BRT) line (also called “Metrobus”) (Alpkokin and Ergun, 2012), underground metro, tram light rail, funicular, ferry, paratransit modes such as minibuses (dolmus), taxis,

company and school service buses. Modal shares for public transport modes are given in Figure 3.3 (IMM, 2017a).

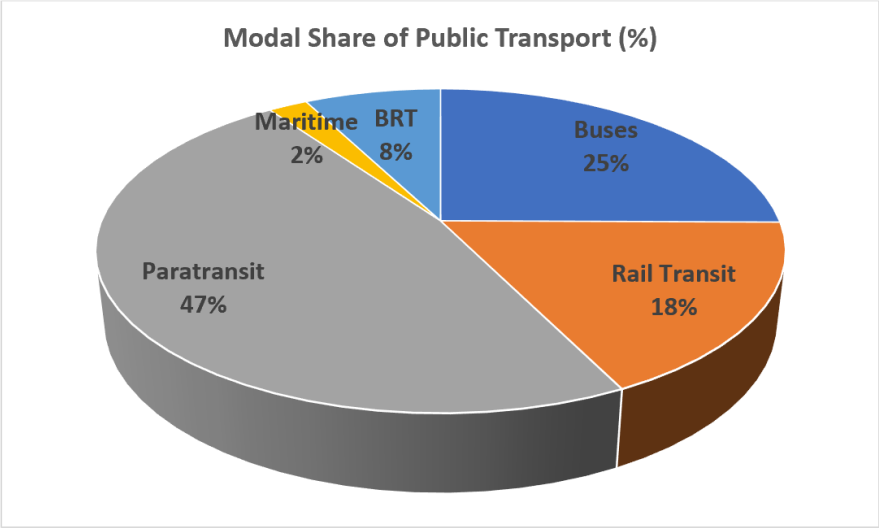


Figure 3.3 : Modal shares for public transport modes.

Service quality problems in public transport such as overcrowded vehicles and unpunctual services lead people to shift to individual private cars. The current car ownership rate is around 180 private automobiles for every 1,000 people, which represents tenfold increase since 1980, reaching 2,644,412 registered automobiles (TSI, 2016b). On the average, 520 new vehicles enter traffic each day in Istanbul (IMM, 2017a). Istanbul is now the 6th worst city in the world and 2nd after Bucharest in Europe in terms of its traffic congestion (Tomtom, 2016) and trip rates with automobiles are expected to increase for the next decades under current circumstances (Alpkokin et al., 2016).

There are various urban transport actors, public and private, constituting the urban transport landscape of Istanbul. These organizations manage, coordinate and provide the urban transport services. However, the fragmentation in the governance of urban transport systems prevents the realization of a coherent urban transport policy and integration between different transport modes. The main authority responsible for the management of urban transport systems in Istanbul is IMM, the local government of Istanbul. IMM carries out this role through the Transport Coordination Committee (TCC), which is composed of the representatives of different public agencies. TCC is the top decision-making body for urban transport in Istanbul and Figure 3.4 shows the committee structure of TCC. This structure clearly indicates the fragmented nature of

governance. Many agencies whose main roles are not urban transport management like Provincial Command of Gendarmerie, Ministry of National Defense, General Directorate of Highways etc. have decision-making powers. Apart from IMM, TCC is also responsible to the Ministry of Interior as stated in its establishment statute (TCC, 2006), which further blurs the responsibilities in decision-making. IETT as a municipal public bus operator has also a role to manage, coordinate and monitor all urban bus services in Istanbul. Apart from IETT, IMM's transport departments such as Department of Public Transport Services, Department of Transport Planning, Department of Transport Coordination also have decision power in the management of all public transport modes (IMM, 2017b). Car traffic is currently regulated by IMM, Traffic Management Department. All of these departments are under the Department of Transport (DOT) in IMM. On the other hand, ISPARK oversees the cycling projects. However, walking is not considered a transport mode. What complicates this picture is the role of Ministry of Transport, Maritime Affairs and Communications (MTMAC) in urban transport management through the large-scale transport projects like Yavuz Sultan Selim Bridge, Eurasia Tunnel and Marmaray.

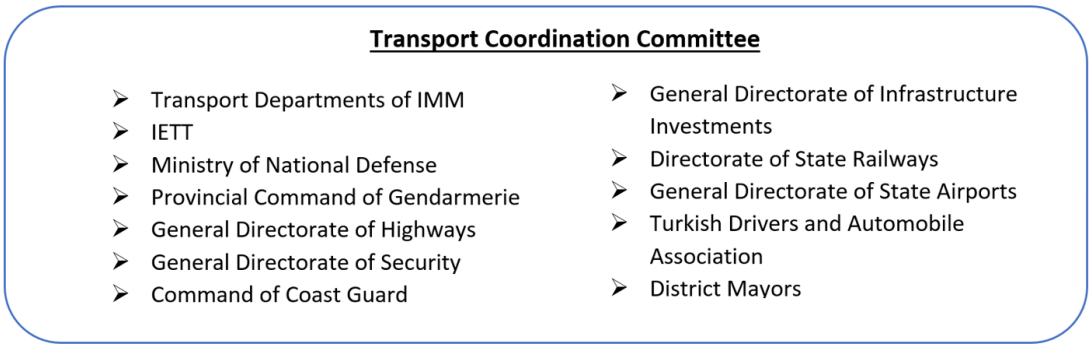


Figure 3.4 : The structure of TCC.

IETT is a government agency having its own legal entity, established as a public organization in 1939 and has its own corporate establishment law (IETT, 1939). Although its administrative structure is independent from IMM, its budget is approved and monitored by the Municipal Council under IMM. IETT is also financially dependent on the grants of IMM, which covers its budget deficit incurred due to operating non-profitable social bus services. IETT is both a public bus operator, providing bus and Metrobus (BRT) services with its own bus fleet, composed of 2,734 standard and articulated buses; and at the same time, it plans, monitors and controls the bus services of private bus operators. Two private bus operators, OHO (meaning

Private Public Buses in Turkish) and OAS (meaning Bus Company in Turkish) have a total of 2,963 buses and provide 71.8 % of all public bus services. These operators are composed of individual bus owners, who form associations among themselves. IMM's Department of Transport is also responsible for the organization of public bus services, which creates an institutional conflict with IETT. Besides IETT, OAS is a subsidiary company of IMM responsible for the provision of public transport services, which further complicates the management of bus services. Furthermore, TCC is also responsible for the approval of the service design elements such as fares, schedules, route plans and market share of bus services in Istanbul. This fragmentation in the governance of bus services is a major reason for the decline in the user satisfaction from the private bus operators' services from 2012 to 2016, as shown in Figure 3.5. IETT's relative increase in the satisfaction scores is due to its high-quality buses, service provision model based on public service rather than commercial interests and its recent restructuring of its management systems according to Business Excellence and Total Quality Management frameworks.

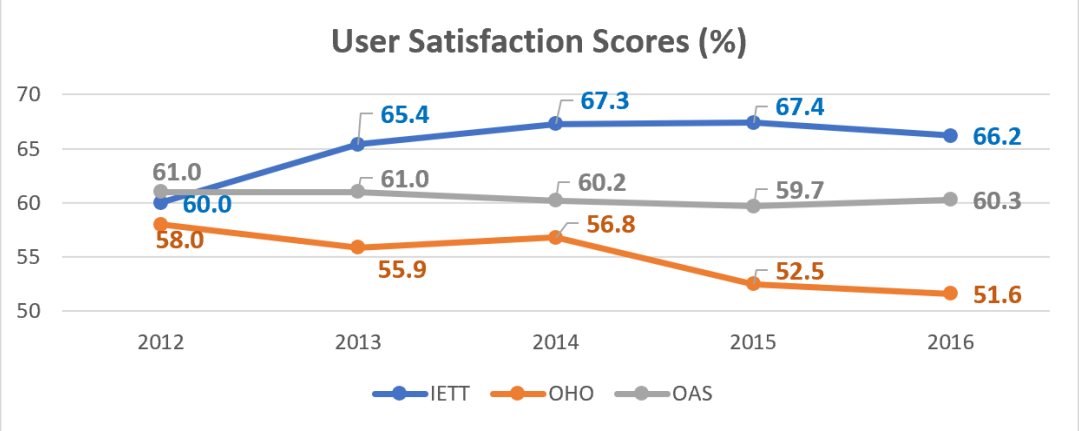


Figure 3.5 : User satisfaction rates (%) of bus services.

IMM has many subsidiary companies to support urban transport service delivery. Although they do not have decision making powers regarding the provision of services, they often complicate and fragment the infrastructural urban transport service delivery. As an example, the provision of intelligent transport systems (ITS) as well as information and communication technologies (ICT) concerning urban transport is provided by ISBAK, which is a subsidiary company under IMM. At the same time, BELBIM, another subsidiary company of IMM, provides electronic ticketing systems (ETS). IETT, on the other hand, has a dedicated budget for providing ITS, ICT and

ETS for bus services. This fragmented picture in the provision of technology infrastructure is an example of how the responsibilities in infrastructure delivery in urban transport are blurred. This also brings about multiple budget allocation for the same kind of service provision activity. Another example is the application of "Smart City" project in Istanbul which is carried out by ISBAK. Besides smart technologies, the smart city concept also involves policy issues such as participative governance, social integration and urban development (Bernardo, 2017; Caragliu et al., 2011), which are all outside the scope of responsibility of ISBAK. Therefore, the adoption of these principles by all transport actors is rather limited, given the restricted power of ISBAK over other transport agencies. Therefore, lack of a central MTA and an institutional framework to support such a MTA limits the application of transformative policy initiatives in Istanbul.

Other formal agencies having a role in the determination of urban transport policies include Mayor, Municipal Council, Secretary-General of IMM, Infrastructure Coordination Committee, subsidiary companies and various departments of IMM regarding transport and land-use, all of which are given decision making powers in the Urban Transport Master Plan (IMM, 2011, p. 106-112). Additionally, various national government agencies also have a say in urban transport policy determination in Istanbul. Some of these are Prime Ministry, State Planning Agency, Privatization Authority, Ministry of Transport, Ministry of Environment and Urbanization, Ministry of Interior, Ministry of National Defense, Ministry of Forest and Water Management. The lack of an institutional framework delineating their specific roles in urban transport policy determination is a major problem which further fragments and blurs the governance structure.

In addition to formal transport entities responsible for the management and operation of urban transport systems, there are various interest groups influencing the policy arena in Istanbul. Minibus associations, private bus operators' associations, taxi associations, service bus operators' associations are powerful interest groups pushing for policy options favoring their commercial interests. The relative power of these associations over urban transport policy is much higher than the unorganized passengers' power. Unorganized interests can be underrepresented in policy processes

(Olson, 2009), and this is a serious concern given the lack of powerful passenger groups or associations advocating for the passenger rights in Istanbul.

3.4.2 The institutional environment

The institutional environment, also called formal institutions, is the second level of the institutional hierarchy, as illustrated in Figure 3.1. This level mainly includes laws, regulations and property rights (Williamson, 2000; Van de Velde, 2004). The formal rules of the game, as North (1990) explains, cover the political, judicial and bureaucratic environment. In urban transport, this institutional level is where the policies and strategies are developed and deployed. Unstable political, judicial or bureaucratic institutions in developing urban transport settings is a major cause of underperformance. Regulatory measures in this level are a major determinant of urban transport performance. For example, European Union (EU) Regulation 1370/07 for public transport passenger services aiming to ensure a competitive environment is a such a rule-changing regulatory measure (Van de Velde, 2003). Actors in the urban transport field adapt their behaviors according to the formal rules set out in this institutional level. As an important element of property rights, ownership structure of the assets strongly influences the performance (Roy and Yvrande-Billion, 2007; Boitani et al., 2013). This structure is largely defined by the existence of a market initiative or an authority initiative regime in a public transport system (Van de Velde, 1999). Among important institutional elements of this level are the competitiveness of the market, public or private ownership of the assets and conditions for market entry and exit.

The institutional environment of Istanbul displays a rather fragmented setting. This fragmentation shows itself most explicitly in three formal institutional elements:

i) policy framework,
ii) regulatory environment,
iii) ownership structure.

To begin with the policy framework, the urban transport policy of Istanbul is specified in the Metropolitan Urban Transport Master Plans, the last of which was prepared by IMM with the collaboration of Japan International Cooperation Agency (JICA) in 2011. The main objectives of the Plan were identified as “enhancing accessibility/mobility as well as improving living environment in Istanbul through

promoting a sure shift from private car use to public transport ridership" (IMM, 2011, p.199). Although public transport is prioritized in the main objective, the sub-goals of the Plan include the followings:

1- To improve public transport services to replace millions of private car use on the existing road network,
2- To increased road capacity to accommodate still increasing car ownership in short and long run,
3- To optimize traffic management and control system for more efficient use of existing road capacity.

The second sub-goal of the Plan is incompatible with the first sub-goal. Increased road capacity induces the traffic demand over time (Hills, 1996; Litman and Colman, 2001; Cervero, 2003), hence the benefits of new roads are quickly eroded. Failing to disincentivize the use of automobiles through "push" measures and policies results in a lower social optimum (Vuchic, 2017). This fragmentation in the policy framework put forward in the Plan explains why improved public transport systems have failed to achieve a modal shift from private car to public transport. This is one of the main reasons for the chronic traffic congestion levels in Istanbul. The Plan also lacks a coherent sustainability framework for promoting a sustainable mobility paradigm. Moreover, the fragmented governance structure also hinders the realization of these policy goals. As a result, lack of a coherent sustainable urban transport policy framework, coupled with a highly fragmented governance structure, has led to an urban transport crisis in Istanbul despite favorable funding conditions.

Regulatory environment in Istanbul is also quite fragmented as there are many conflicting laws and regulations creating "institutional swamps" (Olthaar et al., 2017) which cripples the effective functioning of transport actors. Paratransit modes are partially regulated by IMM in terms of their route plans, fares and schedules. IMM issues route permits for these operators. On the other hand, IETT has formal regulatory power for the public bus services. TCC has the final say on both operational issues and strategic policy issues, but it does not propound any comprehensive policy framework. For all public transport modes, fares have to be approved by TCC, upon the proposal of IETT. The regulatory power of these organizations is assigned by different laws, which incorporate different institutional logics. IETT is granted the regulatory power

over all bus services by its corporate establishment law. Municipalities Law, which was adopted in 2004 and revised in 2012, gives regulatory power over urban transport to the metropolitan municipalities including IMM. The statute regarding metropolitan committees grants TCC with strategic decision making, coordination, monitoring and operational power over all urban transport issues without explaining how these functions and powers are shared with other transport entities.

All the laws and regulations concerning urban transport are given in Table 3.1 with their dates, objectives, relevance for urban transport, responsible entities and conflictual areas. Route and schedule changes, for example, cannot be realized by IETT without the approval of TCC, even though IETT is de jure responsible for the overall regulation of bus services in the city. Therefore; a comprehensive urban transport act should be specifically designed for Istanbul, which would clearly delineate the roles, powers and responsibilities of transport entities. The regulations regarding urban transport have not been specifically designed for this purpose, they rather attempt to regulate different aspects of transport, lacking a holistic and integrated approach. This urban transport act would also be the legal basis upon which the governance structure of the Metropolitan Transport Authority (MTA) can be set up.

Table 3.1 : Regulations concerning urban transport in Istanbul.

Law	Date	Main Objective of the Law	Relevance for Urban Transport	Responsible Entity
3645 IETT Establishment Act	1939	Roles and responsibilities of IETT are defined.	IETT is an independent legal entity, linked to IMM and responsible for the provision and outsourcing of bus, tram and funicular services within the urban area of Istanbul.	IETT
2918 Roads and Highways Traffic Act	1983	Ensuring the road traffic safety in roads and highways and specification of traffic rules	Traffic departments under municipalities are responsible for the regulation of traffic flow and traffic safety in urban roads.	Department of Traffic (under IMM)
86/10553 Ministers' Council Decision Regarding the Grant of License Plates	1986	Setting out the procedures and principles for the grant of license plates	OHO, taxi and minibus operators are given license plates.	OHO, taxi and minibus operators
Directive for City Boats	1995	Setting out the rules of procedures in city boat operations	Route plans of city boats are decided by TCC upon the suggestion of IMM, Department of Public Transport Services	City Boat Operators, IMM, TCC

Table 3.1 (continued): Regulations concerning urban transport in Istanbul.

Law	Date	Main Objective of the Law	Relevance for Urban Transport	Responsible Entity
4925 Road Transport Act	2003	Regulation of the road freight transport	Freight transport in urban areas is regulated by the municipalities.	Istanbul Metropolitan Municipality
5216 Metropolitan Municipalities Act	2004	Regulation of the legal status of metropolitan municipalities to increase efficiency and effectiveness of municipal services	It grants the metropolitan municipalities with the total regulatory power over the urban transport in the metropolitan area including the urban area.	Istanbul Metropolitan Municipality (IMM)
5362 Associations and Professional Organizations Act	2005	Ensuring the professional and training development of associations and professional organizations.	Paratransit operators (minibuses, shared taxis, taxis, company and school service buses) can form associations and act as an interest group.	Paratransit operators
26199 The Regulation Regarding Metropolitan Coordination Committees	2006	Determination of the roles, responsibilities and governance structures of the metropolitan coordination committees (infrastructure and transportation)	All strategic and tactical decision-making power regarding urban transport in metropolitan municipalities is given to TCC. Fares, schedules, route plans, bus stop locations, number of vehicles are decided by TCC.	Transport Coordination Committee (TCC)
Directive for Minibus Operations	2007	Setting out the rules of procedures in minibus operations.	Minibus operators are given route permits and license plates and IMM is responsible for the regulation of these services.	IMM and Minibus Operators
Directive for Taxis and Shared Taxis	2007	Setting out the rules of procedures in taxi and shared taxi operations.	Taxi and shared taxi operators are given license plates and IMM is responsible for the regulation of these services.	IMM and Company and School Service Bus Operators
Directive for Private Bus Operations	2009	Setting out the rules of procedures in private bus operations (only OHO buses)	IETT is responsible for the regulation of OHO services.	OHO operators and IETT
Directive for Company and School Service Buses	2017	Setting out the rules of procedures in company and school service operations.	Company and school service bus operators are given authorization by IMM and IMM is responsible for the regulation of these services.	IMM and Company and School Service Bus Operators

The arrangement of the property rights, or ownership structure, is an important institutional element of the institutional environment affecting the system performance. Istanbul's urban transport system is further fragmented in terms of its prevalent ownership structure. To begin with public bus services, IETT had long been a monopoly municipal bus operator of the city until 1980s. Thereafter, bus services began to be liberalized for individual private bus operations and route permits were issued by IMM which gives an indefinite operating right to the operators. Referred to as "acquired rights", the operating rights were granted by a Ministers' Council Decision, numbered 86/10553, named "the decision regarding the procedures and principles for the grant of license plates" in 1986 (Regulation for License Plates, 1986).

These route permits gave de facto ownership rights to the individual bus operators over their defined routes. Regardless of service quality, these individual private bus operators, called OHO, has the right to operate on the routes allocated for them. While IETT mostly operates on social and non-profitable routes, these operators operate on more central and profitable routes. This model was adopted as an implicit subsidy mechanism so that operators take both revenue and cost risks.

The fact that buses are largely owned by one person or a group of people, rather than a professional company, has egregious consequences on service quality. Although IMM set up a subsidiary company, named OAS, in 2011 for tendering route franchises to bus operators to mitigate the negative performance of OHO operators, those operators do still have individual ownership. The route franchises are given for 15 years, having the similar negative performance effects. Fragmented by a government monopoly and a de facto monopolistic private bus ownership structure, the institutional environment of the urban bus sector crowds out competition and integration, leading to an inefficient performance outcome. Route permits, as license plates, strictly restrict the market entry for potential entrants, which further reinforces this inefficiency.

Public bus operators, albeit having a monopolistic structure, are strongly regulated and monitored by IETT. On the other hand, paratransit operators including minibuses, shared taxis, company and school service buses, taxis operate in a relatively deregulated environment. There are nearly 6,460 minibus operators and shared taxis, all of which have license plates and operate on their specified routes. They do not have determined schedules and bus stops, so they can stop anywhere on the road to take and leave the passengers, causing major traffic safety problems. Reckless driving styles and crowded vehicles characterize the service level of those paratransit operators. The reason of the low service quality in those operators can be attributed to the abovementioned license plate grants. 17,395 taxi operators also have license plates and display similar unprofessional service behavior. On the other hand, nearly 66,269 company and school service buses (IMM, 2017a) are lobbying for obtaining license plates. Since those paratransit operators are not integrated into the electronic ticketing system as in the case for formal transport modes, the exact number of passengers carried by these modes are not known, causing serious service planning problems. The root cause of these problems lies in the unfavorable ownership structure, which

prevents the effective enforcement of IMM's service standards specified for these paratransit modes.

For rail operations, a monopoly municipal subsidiary company, Metro Istanbul, operates all rail modes which include underground metro, light rail, tram and funicular operations. The current rail network is around 156 km (as of March 2018) and IMM aims to expand this network up to 400 km until the end of 2019. Due to chronic problems of the bus and paratransit services, the expansion of the rail network as the backbone of the urban transport system (IMM, 2015) is considered a transformative initiative to relieve urban transport problems. However, without integration with bus and paratransit modes, rail transit system on its own cannot provide accessibility and availability all over the city, which has a rather sprawled urban form. Moreover, the fare structure of the rail transit itself (i.e. transfers between different rail lines are ticketed separately without any transfer discount, penalizing the transfers and increasing the transport costs for users) contribute to the fragmentation of the system. Therefore, the problems caused by the current ownership structure in bus and paratransit operators will likely to perpetuate. They will be just shifting towards the peripheral areas uncovered by the rail network.

3.4.3 Setting up a metropolitan transport authority

To mitigate all these problems, IMM and IETT launched an institutional reform project to establish a MTA in 2015. The primary aim of the project was to improve the organization and management of the urban transport services in Istanbul so that service quality increases and operational costs decrease. Although the initial aim was not directly setting up a MTA, later on, the discussions led to the conclusion that the way for the organizational improvement is through the establishment of a MTA. To solve the conflictual roles of IMM and IETT, a project team composed of IETT and IMM experts and managers from relevant departments was formed. A third-party consultant company was hired to manage the project. The main activities the consultant company carried out were organizing workshops, bringing urban transport experts, academics and consultants from around the world to present case studies and moderating discussions between IMM and IETT teams. The case examples mainly included urban transport authorities from around the world: TFL from London, LTA from Singapore, STIF from Paris region, RTA from Dubai. Other cases included the transformation

examples of the paratransit operators: minibus sector from Johannesburg, taxi sector from Abu Dhabi and bus sector from Seoul.

The project started as an initiative of the bureaucratic top management of IMM and IETT. That is why its scope included mainly organizational and contractual institutional levels (Level 3 and Level 4) rather than more political and strategic levels (Level 2 and Level 1). However, there was not any consensus among the actors, or what can be called as institutional entrepreneurs, about the outputs of the project. The aim to improve the governance of the urban transport was shared by the actors, however, opinions diverged regarding the scope and order of the project steps. After a series of workshops, the main project steps were determined as in Figure 3.6:

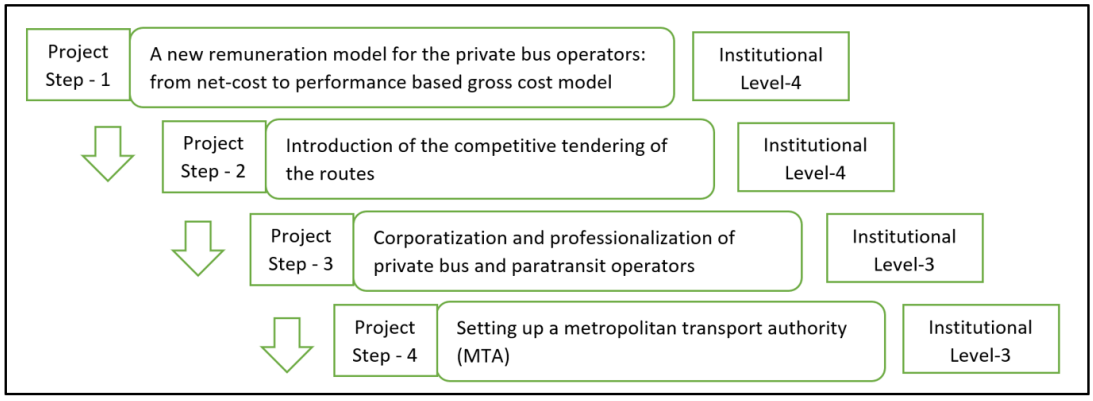


Figure 3.6 : Main steps for the project.

The first step aims to change the remuneration model of the private bus operators from net cost model to performance-based gross cost model. In the current net cost model, all ticket revenues are obtained by the operators, and operational risk is also carried by them. However, the incentive to carry the maximum number of passengers per trip just for profitability causes crowding problems inside vehicles, competition of buses for passengers on the road, safety problems as well as planning problems. As routes are de facto owned by the operators, it is quite hard for IETT to make route and schedule planning. This is why the project first aimed to eliminate the rent-creating characteristic of the current net-cost model. According to the performance-based gross cost model, the private bus operators would obtain their revenues based on the vehicle kilometer they supply (gross-cost) and the service quality (performance).

The second step targets the introduction of contracting, or competitive tendering, with bus operators. The contracts would be network-based rather than route-based as routes

need to be frequently adapted to the changing conditions. The main aim was to abolish the de facto monopoly rights over the routes. The reason for the Step-1 to be planned before Step-2 was to first eliminate the rent over the routes due to net cost model, thereby lessening the opposition of the profitable route "owners".

The objective of the third step is to corporatize the individual bus and paratransit operators and by this way, creating more professional and quality-oriented service providers. The sub-steps include the integration of the paratransit operators' vehicles into the ticketing system and central vehicle monitoring system through GPS, route and schedule planning for minibus and shared taxis and training of the drivers. Since corporatization of the current individual private bus and paratransit operators required a long time (5-7 years) to transform according to the project planners, this step was positioned after Steps 1 and 2 in order not to delay the progress of the project.

Last step is to set up a MTA as the sole planner and organizer of the urban transport system including all modes of transport. Two scenarios were put forward. The first scenario was to transform IETT into a MTA-structure. In this case, IETT would leave its role as an operator and hand over this role to private bus operators. The second case is to truncate IETT's role of planning over bus operations and make IMM as the MTA of urban transport in Istanbul. In this case, IMM's technical capacity for planning would be strengthened. Among two alternatives, however, the first one gained priority due to IETT's experience in planning, monitoring and supervising the bus operations for more than 75 years. IETT's corporate history dating back to 1870s and its strong institutional culture makes it organizationally an appropriate candidate for becoming the MTA of Istanbul.

Although it has become nearly two years after the project started, there has not been any concrete progress and tangible result. Workshops with stakeholders of the project have been organized, international consultants have been employed and a department, named Transport Systems Development, within IETT has been created and charged to lead this project. However, the prospect of establishing a MTA is not on the horizon. There is some progress in Step-1 for changing the remuneration model. The project team has developed a performance-based gross cost remuneration model for private bus operators. In the new model, fixed costs of the operators are compensated, and a unit payment is done for each vehicle kilometer supplied. Performance payments are

calculated based on patronage with 30 % weight, service quality score with 30 % and punctuality with 40 %. The new remuneration model was submitted for the approval of the Municipal Council; however, it was rejected. Currently, the project team has been dissolved without any outcome achieved and the future of the project is unclear.

3.5 Discussion

There are various reasons for this setback of the project. Returning back to the institutional change framework we developed in Section 3.2, the project has failed to take into account the constraints of the upper institutional levels on the lower ones. Institutional change projects require dealing with many institutional elements together. Without effectively addressing the institutional elements and levels which have potential effects on the institutional element that is tried to be changed or reformed, institutional change attempts are less likely to bring about the desired results. The primary reason for failing to set up a MTA in Istanbul is arguably the failure to address the broader political, institutional and strategic power dynamics and vested interests of the incumbent actors.

In our case example, the main reason for the setback of the project is failing to take into account the institutional level 2, namely the institutional environment. Before all, there was not any consistent urban transport policy framework (Level 2) as a guideline necessitating the transformation of the governance structure (Level 3) for a more integrated and public transport oriented urban transport system. The project started only as an initiative of some of the top managers in IETT and IMM. There has not been a consensus over the aims and the roadmap of the institutional transformation as well among the decision makers of main urban transport entities. The most important factor hindering the progress of the project is the lack of an urban transport act which would delineate the roles and responsibilities of the actors in the system. Without such an act and a MTA based on it (Level 2 and Level 3), introducing a new procurement model and a competitive tendering scheme (Level 4) is ineffective. Currently IMM is not technically competent to carry out the tendering program. On the other hand, IETT as an operator is not an appropriate organization for the application of this model. Therefore; developing an urban transport act and setting up the MTA should have been the first step of the project.

Another major error, related with institutional positioning of the projects steps, is trying to introduce a new procurement model and a competitive tendering framework (Level 4) without adequate corporatization of the operators (Level 3). Individual or associational management of individual bus and paratransit operators is not suitable for the internalization of a performance culture. Performance-based remuneration schemes is effective when there is already a performance or quality culture (Level 1) wired into the organizational culture. However, transforming the organizational culture of a sector requires a much higher institutional horizon and a long-run perspective. Monitoring a performance-based gross cost model and a competitive tendering scheme also requires an improved technical capacity on the part of the MTA. However, IETT is not currently able to manage and organize the new tendering and remuneration model. Therefore, the establishment of a MTA should be accompanied with an institutional capacity building program (Level 3).

Finally, taking into consideration the institutional change framework developed in Section 2 and the discussions mentioned above, the following sequence of project steps is recommended in Figure 3.7 for Istanbul's institutional change project:

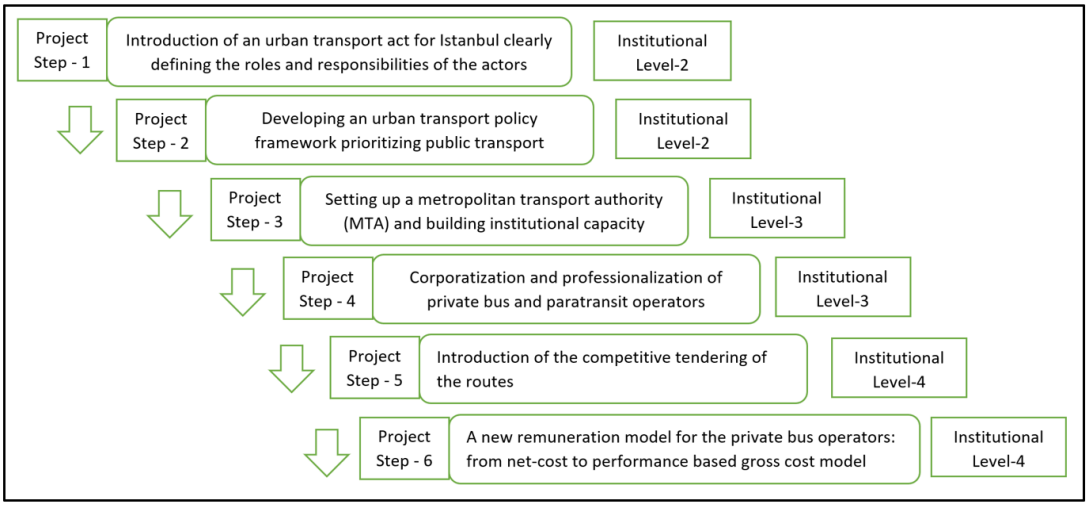


Figure 3.7 : Recommended steps for the project.

The political support for the institutional transformation of the management system in urban transport is undoubtedly indispensable. A stakeholder analysis is vitally important to understand how different stakeholders are affected by the institutional change. The participation of the other departments of the agencies involved in the project is also critical in pooling the diverse viewpoints and expertise. In Istanbul, the main actors influenced by the establishment of a MTA and changing the contractual

model are the bus and paratransit operators. Different associations of bus, minibus, taxi, company and school service bus operators exert powerful influence on the urban transport policy decisions of the local government. Therefore, any regulation that would cripple their commercial interests is quite likely to be responded with powerful opposition from these groups. On the other hand, satisfying the demand for affordable, safe, reliable and comfortable public transport services of the citizens within such a constrained environment is becoming gradually harder. The problem of vested interests in the institutional change attempt of Istanbul is not only relevant for paratransit operators, but it involves the public organizations as well. For more than a century, both IETT and IMM have had bureaucratic power over the management of urban transport of Istanbul. The institutional inertia accumulated over time prevents new formations of institutional arrangements. In this way, strong institutions can be an advantage for stability, cohesion and integration of organizational elements. On the other hand, they can also be a disadvantage for agility, flexibility and adaptiveness, which are important features for an organizational structure which is open to change.

4. AGENCY COSTS IN PUBLIC TRANSPORT SYSTEMS[3]

4.1 Introduction

The entities comprising the urban mobility system interact with each other as they are embedded in an institutional environment where interests, actions and liabilities are shaped and defined. Regulations, property rights, legislation, social and cultural norms, as well as contractual relations, constitute this institutional environment. Governments, passengers, regulators (authorities) and operators all have specific needs, interests and demands, which might conflict with each other. The relationship between transport operators and authorities are specified in formal contracts. These contracts define the operational, financial and technical requirements to which the operators must comply and penalties for non-compliance.

The financial remuneration model is also specified in these contracts. There are three main remuneration types that specify the payment to the operator (Veeneman et al., 2014). These are: gross-cost (GC) contracts that specify the payment of a lump sum amount to the operator, where the payments are made by per bus kilometre, per bus, per service hour or a combination of any two (Chaudhary, 2015); net-cost (NC) contracts require the payment of a lump sum subsidy plus receipts from ticket revenues; and performance-based (PB) contracts require the calculation of payments to operators by quality incentives such as punctuality, customer satisfaction, patronage, and so on. Within each model there are different possible conflicts of interest as each contract specifies a different risk allocation both to the operator and to the local authority.

Agency theory is a branch of economics that explains the conflicts of interest between "Principal and Agents". It is well suited to examine a relationship where the transport

[3] This chapter is based on the paper "Canitez, F., Alpkokin, P., & Black, J. A. (2019). Agency costs in public transport systems: Net-cost contracting between the transport authority and private operators-impact on passengers. *Cities*, *86*, 154-166" DOI: https://doi.org/10.1016/j.cities.2018.09.010

authority is the "Principal Agent" who delegates service provision to private operators as sub-ordinate "Agents". Agency theory is important to the understanding of contract administration, especially with the increase in the number of public-private partnerships (PPP) transactions in the transport sector. The literature on agency theory specific to urban mobility includes: analysis of vehicle owners and drivers in motorcycle-taxi market (Blimpo, 2014); the role of social networks in the taxi industry (Schneider, 2010; Jackson and Schneider, 2011); traveller mode-choice (Anwar, 2016); the "sharing" economy (Cohen and Kietzmann, 2014); analyses of fixed-price and cost-plus contracts (Gagnepain et al., 2013); authority-operator relations in Spanish urban transport contracts (Pilar and Rus, 2010); and public-private partnerships (Ni, 2012; Iossa and Martimort, 2015; Wang and Liu, 2015).

The significance of this paper is that service quality outcomes of remuneration types - such as NC or GC contracts between transport operators and authorities in weak institutional settings - have not been fully covered by transport researchers from an "agency theory" perspective. This paper provides a theoretical as well as a practical assessment of this topic using private transport operators in Istanbul as a case study.

Istanbul has nearly 11.5 million daily public transport journeys including bus, rail, ferry and paratransit modes and 37.6 % of those journeys are made by private bus and minibus operators (IETT Statistics Report, 2017). In Istanbul, crowding, safety problems, unregulated competition on the road for passengers are some of the serious service quality problems for passengers, the root cause of which can be attributed to the remuneration model of these operators. From the beginning, these private operators have been obtaining their remuneration based on the number of passengers they carry, which leads to conflicts of interest amongst the local government, operators and passengers. Operators carry the revenue and cost risks in this model, leading to various agency costs. Whereas the local authority is concerned with the quality of service (including the timeliness, comfort, availability and affordability of the public transport services), private operators try to maximise their profits - both by attempting to increase their revenues as well as decreasing their operation costs. The NC model in Istanbul's case is especially problematic because of a lack of subsidy mechanism in case of any operator's losses.

Based on our analysis of quantitative and qualitative data, a contractual solution to alleviate conflicts of interests is proposed in the form of performance-based gross-cost

(PrGC) contracts. Agency theory provides a conceptualising framework to put forward the agency costs of the NC contracting in Istanbul's case. Here, agency costs are listed as four propositions in terms of decreased safety and comfort, decreased affordability, increasing monitoring costs and decreased reliability. Then, a further two propositions are developed to show how the PrGC contract can mitigate those costs.

4.2 Methodology

4.2.1 Literature on agency theory

Agency theory deals with the agency relationship where one party (principal) delegates work to another (agent), who performs that work (Eisenhardt, 1989a). In the case of public transport, agency theory provides a conceptual framework that delineate the potential conflict of interests underlying the relationships amongst the government, the regulators, the operators and passengers. The principal agency is the government (local, state, and national in the case of city-states such as Singapore) and service delivery is performed either directly by a government agency as the operator, or by delegated contract to a private operator - all within the context of an institutional regulatory environment. Agency theory takes a contractual perspective that analyses these relationships (Jensen & Meckling, 1976).

When new public transport infrastructure (right of way and vehicles) is to be delivered the principal agent formulates a procurement strategy that, in contractual terms, might be a traditional government design and construct project, an alliance contract, or a public-sector and a private-sector partnership (Amos, 2004). From these perspectives, there are government agency relationships with the design, construction (or fabrication) and service operators and the users (customers) - both for new and existing public transport services.

A case study methodology provides tools for researchers to study complex phenomena within their contexts (Baxter and Jack, 2008). Furthermore, this methodology is well suited to develop theory, to evaluate various interrelationships amongst the actors in the system, to recommend policy reform and to study institutional change (Alston, 2008). This approach allows the researcher to explore actors and organisations, complex interventions, relationships, policies and programs (Yin, 2013).

4.2.2 Research questions

In this research, our case example is the current NC contractual arrangement of private bus and minibus operators with the local authority in Istanbul as the principal agent. A case can be defined as:

> "a phenomenon of some sort occurring in a bounded context. The case is, in effect, the unit of analysis" (Miles and Huberman, 1994, p.28).

The two research questions can be summarised as: how does the NC model transfer risk and lead to agency costs? and how can these costs be mitigated by the principal agent? This case example is analysed by formulating four theoretical propositions that we put forward by drawing on the following inputs:

- the interviews undertaken with the experts, planners and managers in IETT (standing for "Istanbul Electricity, Tram and Tunnel") which is the municipal public bus operator in Istanbul; and
- the outputs of the workshop entitled "Workshop for performance-based remuneration model", which was held on 9 December 2016, where we participated with representatives from the local government, IETT and bus operators (Toygar, 2017).

Our propositions can be formulated as in the following:

NC contracting "in weak institutional and regulatory contexts" cause:

1- Decreased safety and comfort;
2- Decreased affordability;
3- Increasing monitoring costs; and
4- Decreasing reliability.

Propositions from 1 to 4 are confirmed through the results of user satisfaction surveys carried out by IETT to measure service quality as the supervising agency for private bus operators. Additionally, interviews conducted with experts, planners and managers from the Strategy Development, Transport Planning and Private Bus Operations Department of IETT are also used to give evidence on these propositions. Figure 4.1 shows the structure of these propositions.

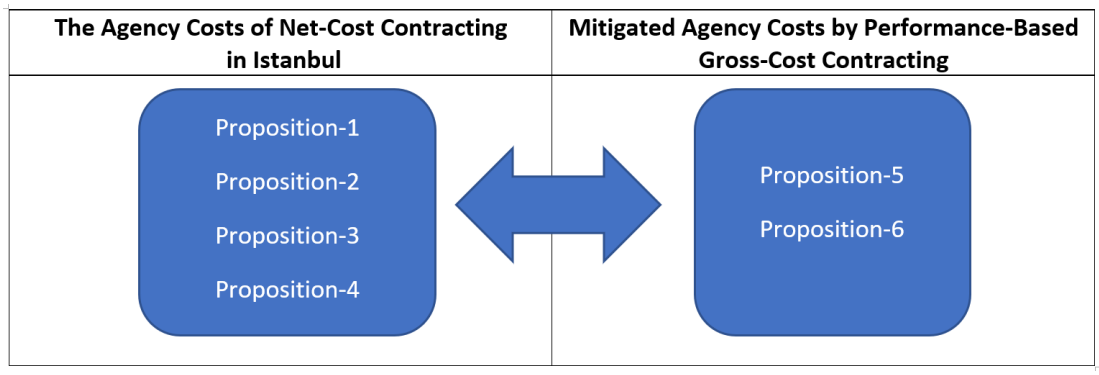


Figure 4.1 : The structure of propositions.

Quantitative and qualitative evidence is presented to support and verify these constructed propositions so as to provide a convincing grounding, which is a key criterion for successful theory building from case studies (Eisenhardt, 1989b). After that component of the research was concluded, two further propositions were formulated to show how a PrGC contracting model could alleviate the agency costs incurred in NC contracting. These two propositions are the following.

PrGC contracting "in weak institutional and regulatory settings" can alleviate the agency costs of NC contracting by:

1- Increasing reliability; and
2- Increasing safety, comfort, affordability and decreasing monitoring costs.

The reason why PrGC includes two propositions instead of four, as in NC model, is that the agency costs given in propositions 1, 2 and 3 can be mitigated by changing to GC contracting. The agency costs given in proposition 4, on the other hand, can be mitigated by the performance part of the proposed contracting model. Therefore, those three propositions are aggregated in a PrGC model.

4.3 Urban Mobility Context

With a population of approximately 14.6 million people and a metropolitan area of 5,343 km^2, Istanbul is the most populated city of Turkey as well as being the economic, cultural and historic centre of the country (Turkish Statistical Institute, 2016). As a result of population growth, Istanbul has to deal with increasing personal mobility and road traffic congestion. The number of registered private motor vehicles in Istanbul has almost multiplied tenfold since 1980, reaching 2,644,412 in 2016 (Turkish Statistical Institute, 2016), which means nearly 180 private cars for every 1,000 people

– still at an early stage of automobile ownership. Under current trends, it is expected to rise radically along with the increased trip rates for the next few decades (Alpkokin et al., 2016).

The public transport system in Istanbul has had difficulties in coping with this rapid growth and changing urban structure. The public transport system is managed and regulated by the Istanbul Metropolitan Municipality (IMM). Its urban transport services include buses and a 52-km of bus rapid transit (BRT) line (Alpkokin and Ergun, 2012), 156 km of urban rail network (underground metro, light rail, tramway, funiculars, including the Marmaray (Bosphorus Rail Tube Crossing), maritime services and paratransit modes such as minibuses, taxis, shared taxis and company and school service buses.

In 2017, private bus operators, with 2,963 buses, carry approximately 2.2 million passengers on an average day; private minibus operators, with 6,361 minibuses, carry approximately 2.1 million passengers per day. The role of those private operators is increasing from year to year as the mode share of the municipal public bus operator, IETT, is shrinking. The mode share of IETT buses declined from nearly 50 % in 2009 to 19 % in 2016 (see Figure 3.2). Whereas private bus operators first started operations in 1981, minibus operators have been operating since the 1950s. Privatisation of the bus services has led to a decrease in service quality, contrary to the expectations of the local government of Istanbul.

The regulatory landscape of Istanbul's urban transport shows a fragmented picture. While IMM is the main government agency that is responsible for the management and organisation of urban transport services, it carries its role through the Transportation Coordination Committee (TCC), which is comprised of the representatives from various public bodies in Istanbul. This committee is the top decision-making entity for the management of urban transport. IETT, on the other hand, is an independent public agency, established in 1939 with its own corporate establishment law ("IETT Corporate Establishment Law", 1939).

This law gives IETT the power to organise public transport services, including tram, bus and trolleybus services. IETT is responsible for service design elements such as fares, schedule and route plans of its own buses as well as those of the private bus

operators. However, all of this is subject to the approval of the TCC. Paratransit modes are regulated by the IMM's Transport Department. Therefore, all modes, whether public or private, are regulated by IMM, TCC and IETT, which creates a fragmentation in the governance of urban public transport services. The numerous problems regarding the service quality of public transport services are largely due to this fragmentation in the regulatory landscape. As part of our research design, the regulatory environment is taken for granted, and problems and recommendations are addressed at a contractual level rather than at the regulatory level.

Table 4.1 shows the mode shares and average daily number of passengers, respectively, obtained from government sources (IETT Statistics, 2017). The private bus operators' modal share, composed of OHO (Ozel Halk Otobusleri, meaning Private Bus Operations in Turkish) and OAS (Otobus A.S., meaning Bus Corporation in Turkish) buses, in the public bus market, has increased over the years 2009 - 2016 from 32.1 % to 58.5 % due to IETT's policy to withdraw from profitable routes and leaving those routes to be operated by private bus operators.

Table 4.1 : Average daily number of passengers and modal shares (2017).

	Modes	Average Daily Number of Passengers	Modal Share (%)	Total Modal Share (%)
Land Passenger Transport (83.8 %)	BRT (Metrobus)	800,000	8.3	6.9
	IETT Buses	927,546	9.6	8.0
	Private Bus Operator 1 (OHO)	*1,441,334*	*14.9*	*12.5*
	Private Bus Operator 2 (OAS)	*795,504*	*8.2*	*6.9*
	Minibuses	*2,100,000*	*21.7*	*18.2*
	Shared Taxis	110,000	1.1	1.0
	Taxis	1,100,000	11.4	9.5
	Company and School Service Buses	2,400,000	24.8	20.8
	TOTAL	9,674,384	100.0	
Rail Transport (13.9 %)	Metro	613,062	38.2	5.3
	Light Rail	308,420	19.2	2.7
	Tram	497,230	31.0	4.3
	Tunnel-Funicular	48,837	3.0	0.4
	Nostalgic Tram	1,983	0.1	0.0
	Cable Car	5,966	0.4	0.1
	Marmaray	129,895	8.1	1.1
	TOTAL	1,605,393	100.0	
Maritime Transport (2.3 %)	Private Sea Buses	20,610	7.8	0.2
	Public Ferries	106,357	40.2	0.9
	City Boats	137,285	52.0	1.2
	TOTAL	264,252	100.0	
	ALL MODES TOTAL	11,544,029		100.0

Table 4.2 shows the market organisation of Istanbul's land passenger public transport system, including public buses (IETT, OHO, OAS), minibuses, company and school service buses, taxis and shared taxis (but excluding rail modes) as of 2016.

Table 4.2 : Market organization of Istanbul's public transport system (2016).

Modal Type	Operator	Form of Ownership	Number of Vehicles
Bus	IETT	Municipal Public Operator	2,141
	OHO	Individual Private Operators	2,057
	OAS	Subsidiary Private Operator	906
BRT	IETT	Municipal Public Operator	593
Minibus	Individual Operators	Private Operators	6,361
Company and School Service Buses	Individual Operators	Private Operators	56,000 (approx.)
Taxis and Shared Taxis	Individual Operators	Private Operators	17,000 (approx.)

OHO is not a private company *per se* but it is an association of individual bus operators whose operations are based on yearly licenses (albeit renewed each year). OAS is a subsidiary company under IMM that has the right to contract out its routes to individual private operators for 15 years. IETT, as a public bus operator and regulator, is responsible for monitoring and regulating these private bus operators' services. Even though IETT has been withdrawing from operations as shown in Figure 4.2, it acts as a supervising and monitoring agency for private bus operators. The reason for IETT's having such a role is because of its experience in Istanbul's public transport system from 1871 onwards, with its current 2,734 buses, 2.9 billion TL (845 million USD) annual budget and two control centers for monitoring all bus operations.

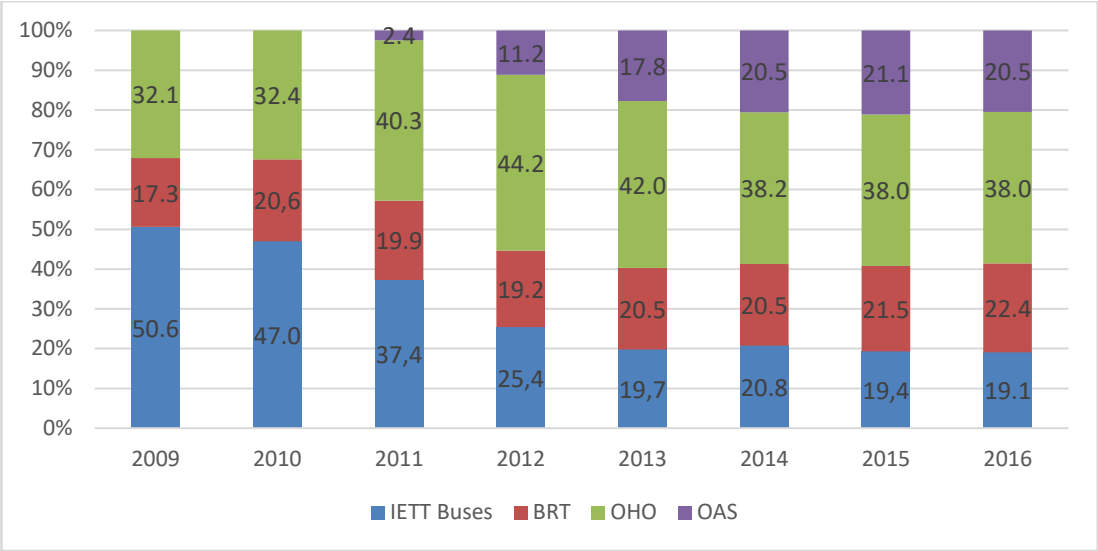


Figure 4.2 : Modal shares of buses and BRT over the years 2009-2016.

The private bus operators operate mostly on profitable routes, while IETT's own buses operate on what are called social routes. These routes are defined by IETT as any route which is operated because of minimum service obligations as a public service irrespective or not whether that route is profitable. At the same time, IETT also operates along the routes of private operators as a support and feeder service. IETT has 526 routes, whereas private bus operators have 366 routes including OHO and OAS. Totally, there are 745 routes, some of which are overlapping routes of IETT and the private bus operators. Figure 4.3 shows the route layout map of Istanbul based on operator type.

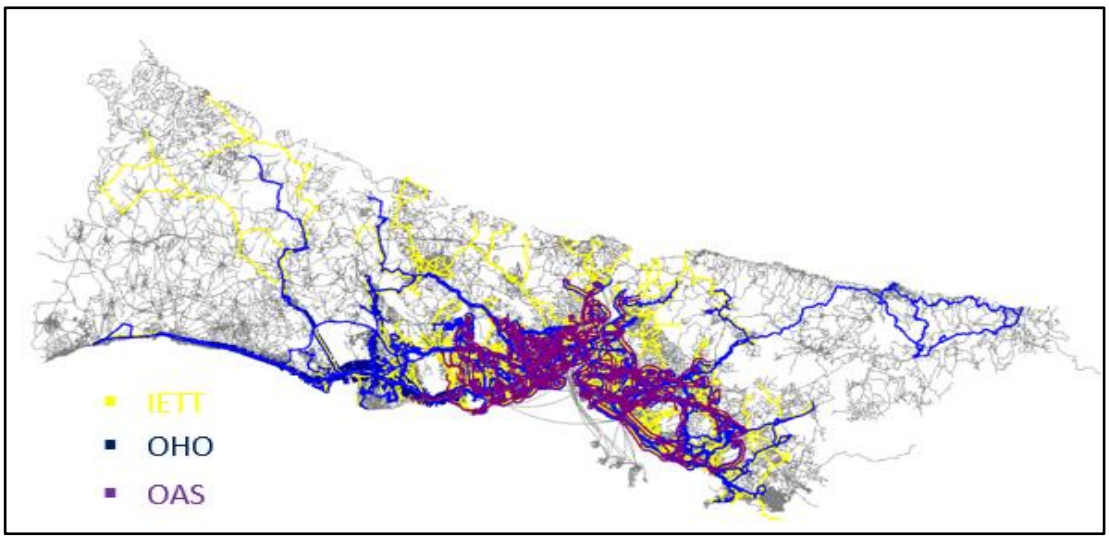


Figure 4.3 : Route layout map for bus services based on operator type.

The private bus operators' operating revenue comes directly from ticket revenues, and they finance their own operating expenses. This is the NC remuneration model. There

is an implicit subsidy model for private bus operators as they operate primarily on profitable routes. Figure 4.4 illustrates the profitability of the private bus operators including both OHO and OAS. Whereas the green part shows the individual bus operators making a monthly profit more than 5,000 Turkish Lira (TL) (US $1,655.6), the yellow part shows those making less than 5,000 TL, and red part shows those making a loss. Loss-making bus services are cross-subsidised by the buses operating on the profitable routes which belong to the same owner/operator.

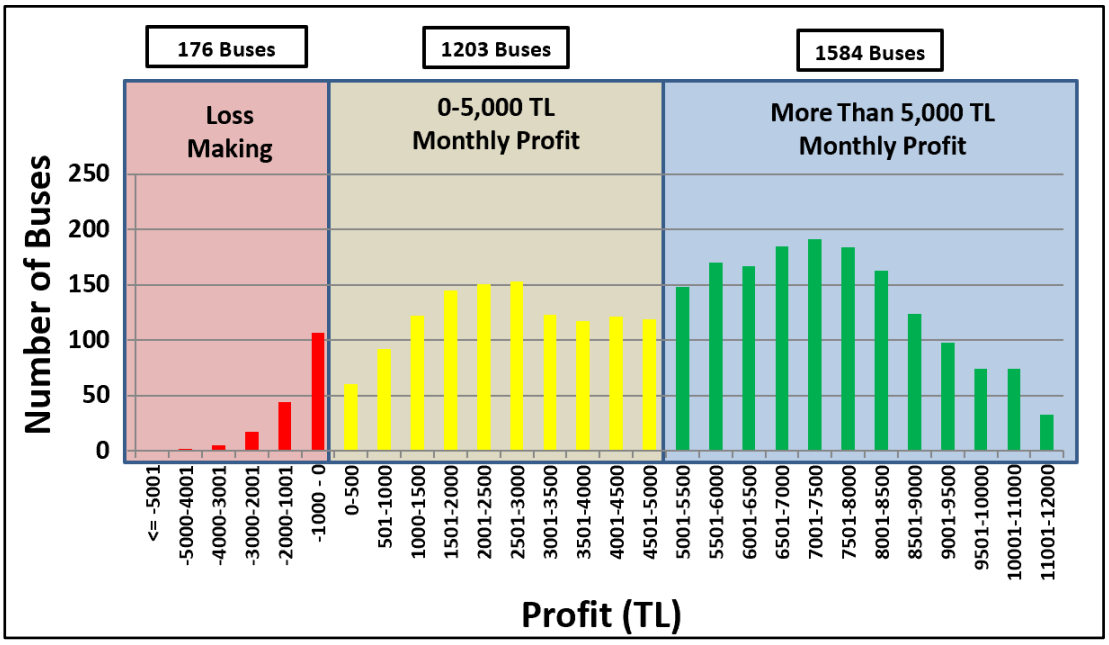


Figure 4.4 : Profitability of private bus operators in Istanbul (2016).

The license that gives a yearly exclusive operating right to OHO operators does not specify the route, schedule, fare and service levels: it only specifies certain penalties related with the violations of traffic and operational rules. Nor does it specify the working and employment conditions of the drivers. IETT itself assigns the routes and schedules for these OHO operators. TCC and IMM set the fares. OAS buses, on the other hand, operate in 5 different operating areas based on 15-year contracts. Their schedule and service levels are determined by IETT (shown as dotted lines in Figure 3.5) and their routes are specified in the contracts. All private buses, OHO and OAS, are part of the integrated ticketing system in Istanbul, which uses “Istanbul Kart” as the medium of payment.

Minibus operators are the paratransit transport services in Istanbul that have their own specific routes without any publicised schedules nor designated bus stops. Depending on the vehicle type, the minibus vehicles have a capacity of 9 to 15 passengers. They

are the least regulated transport mode in Istanbul. They are not part of the integrated ticketing system and obtain their revenue directly from cash payments by customers. Minibus operators have formed the Minibus Association, which is a powerful organisation having a great deal of bargaining power over Istanbul's urban transport policy decisions. Minibus operators, together with private bus operators, exhibit a predatory behaviour on the roads so as to grab as many passengers as possible in order to increase their operating revenue at the expense of the comfort and safety of the passengers.

Their profit maximisation behaviour causes safety and comfort problems for passengers in Istanbul (Ozkurt, 2012). Private operators' interest in profit maximisation conflicts with the expected standards of comfort and safety levels of city authority. These modes, during the rapid urban expansion of Istanbul from 1950s to 1990s, provided an immediate solution to the mobility demands from newly-expanded areas of the city that lacked services from the more regulated public transport modes (Orhon, 1996; Uygun, 2012).

Agency relationships shown in Figure 4.5 summarise all of the regulatory and supervisory relations amongst the local government of Istanbul (IMM), TCC, IETT, OHO, OAS, Minibus Association, individual bus and minibus owners and passengers, which helps to conceptualise the actors, their relations with each other, their roles and their positions within the public transport landscape of Istanbul.

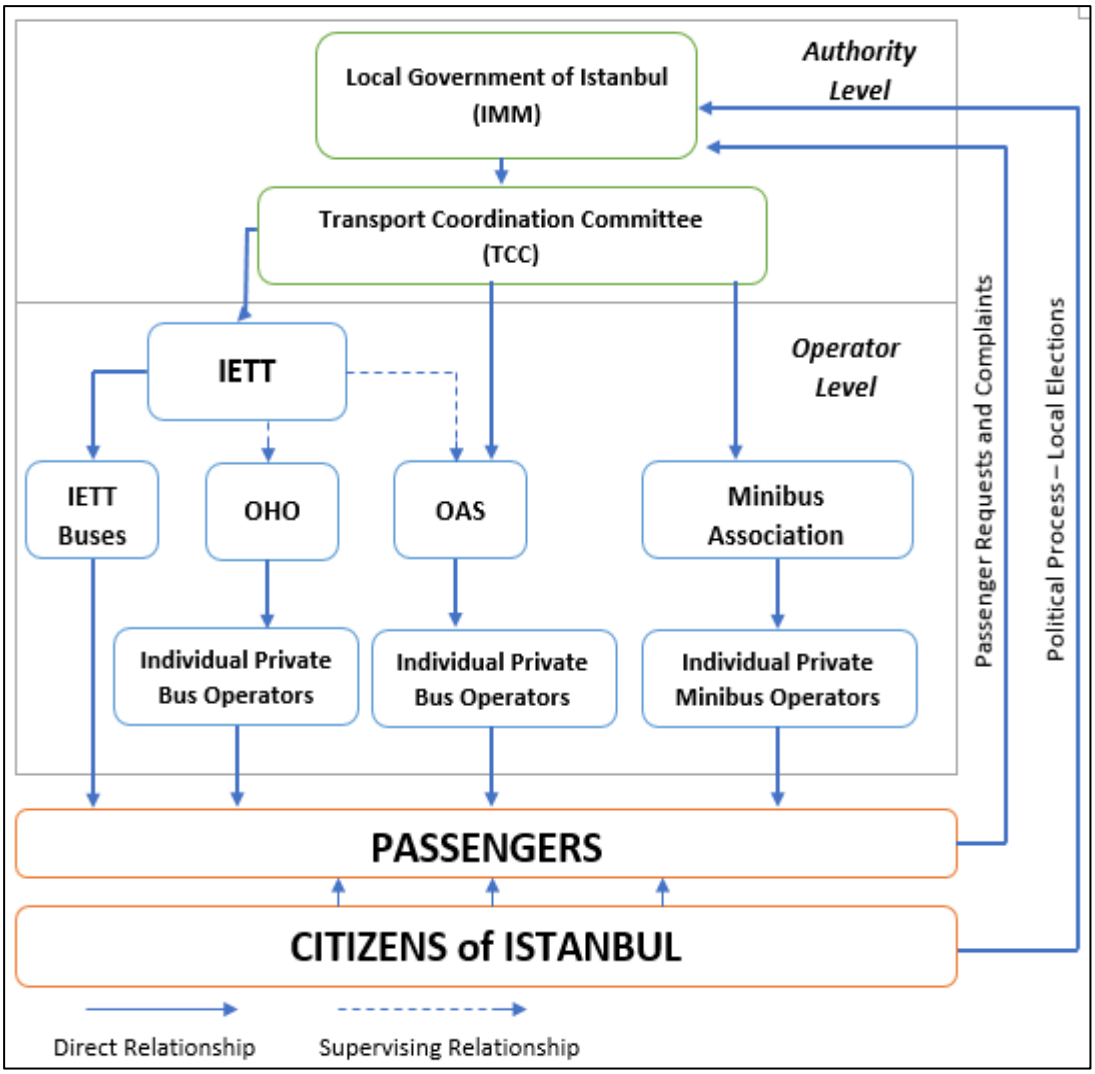


Figure 4.5 : Map of mobility actors.

The role of the citizens of Istanbul can be described as follows. Passengers forward their requests and complaints directly to IMM, through several channels, such as the Call Center (153), social media, mobile applications, lobbying and formal petitions. Passengers, as citizens, also participate in local election processes every five years, providing the basis for the Principal-Agent relation between citizens and IMM.

4.4 Agency Costs of Private Bus and Minibus Operators

Private bus and minibus operators create agency costs in various ways. Agency costs are internal costs incurred from conflicts of interest between principals and agents in an organisation. Agency costs arise when the goals of principals and agents differ. They are the negative externalities stemming from the nature of the Principal-Agent Relationship. If there are not agents, these agency costs would not be incurred.

When public transport services are provided directly by the Government, without any contracted private operators, there would not be any agency costs because of the absence of any profit motive causing conflict of interest. Agency costs occur in any contracted public transport regime because of the profit incentive of private operators, as opposed to social service obligations of Government agencies. Besides negative externalities in the form of reduced service quality, agency costs also include any costs associated with managing and resolving this conflict of interests, such as monitoring and enforcement costs.

IMM, the "principal" from agency theory, states its strategic vision of urban mobility in the Strategic Plan for 2015-2019 as:

> "developing novel mobility policies to help citizens benefit from urban mobility services in a reliable, affordable, safe and comfortable manner" (IMM Strategic Plan, 2015, p. 49).

IMM represents and reflects the interests of the passengers in the city, whereas private bus and minibus operators play the role of agents. They are expected to align their services with the strategic vision of IMM.

The issue to determine is to what degree they align their actions according to this strategic goal. We argue that there are four fundamental ways the interests and strategic actions of IMM and private bus and minibus operators conflict and create agency costs for the citizens as passengers.

4.4.1 Agency cost-1: decreased safety and comfort level

First, the current NC model fosters the incentive of private bus and minibus operators to carry more and more passengers because of increased revenue and profit from each additional passenger. The interests of actions of these operators are in alignment with that of IMM, as long as they help providing a "*reliable, affordable, safe and comfortable"* mobility service. The conflict occurs when this profit maximising incentive begins to jeopardise a safe and comfortable journey for passengers. Considering the lack of institutional arrangements, rules and procedures to set a specific threshold for comfortable journeys or acceptable comfort levels (normally specified precisely as key performance indicators such as "overcrowding" in the

contract), private bus and minibus operators almost always carry the maximum number of passengers possible, at the expense of passenger comfort and safety.

Being the least regulated transport mode, minibuses carry passengers with the doors open during the journey to squeeze in more passengers thereby risking the safety of other passengers. Cash handling by the drivers during the journey, as minibuses are not integrated into electronic ticketing system of Istanbul, also threatens the safety of passengers. The behaviour of these minibus operators is largely attributable to the financial NC model, which leads to opportunistic and predatory street behaviour, posing agency costs and negative externalities to society in the form of uncomfortable and unsafe mobility services.

Therefore, the following proposition is to be tested empirically:

Proposition 1: *The private bus and minibus operators have an incentive to risk comfortable and safe mobility services for passengers to increase their operational revenues and profits under the NC model.*

This proposition is supported by consulting the results of a user satisfaction survey (USS). This shows the satisfaction rates for the comfort and safety levels for each bus mode, including IETT, OHO and OAS. As there has not been any survey conducted for minibus services so far, this mode is excluded from the graphs. Figures 4.6 shows the stark difference between satisfaction scores of private bus modes (OHO and OAS) and public bus mode (IETT) for comfort and safety.

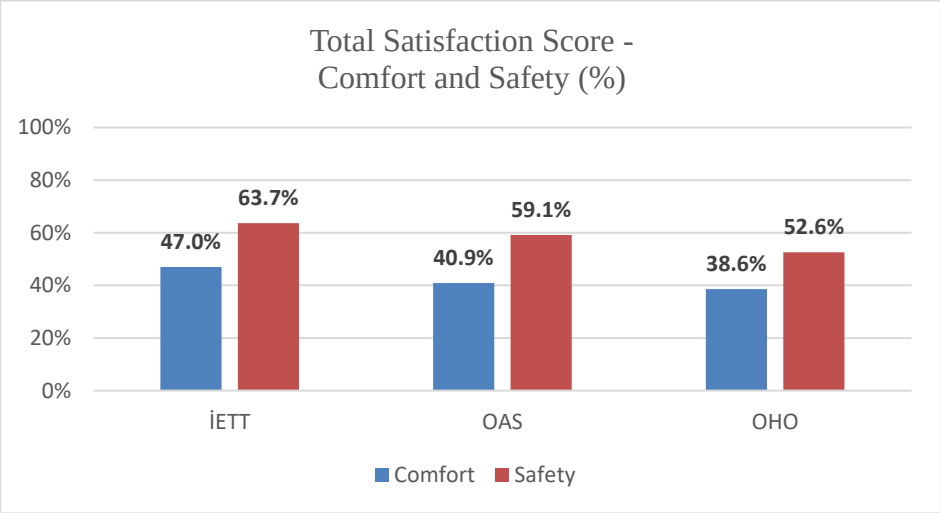


Figure 4.6 : User satisfaction rates (%) – comfort and safety.

Figure 4.7 further confirms the difference between levels of safety through the measurement of the number of accidents per million km for IETT, OHO and OAS. OHO and OAS have considerably lower safety performance measures compared to IETT.

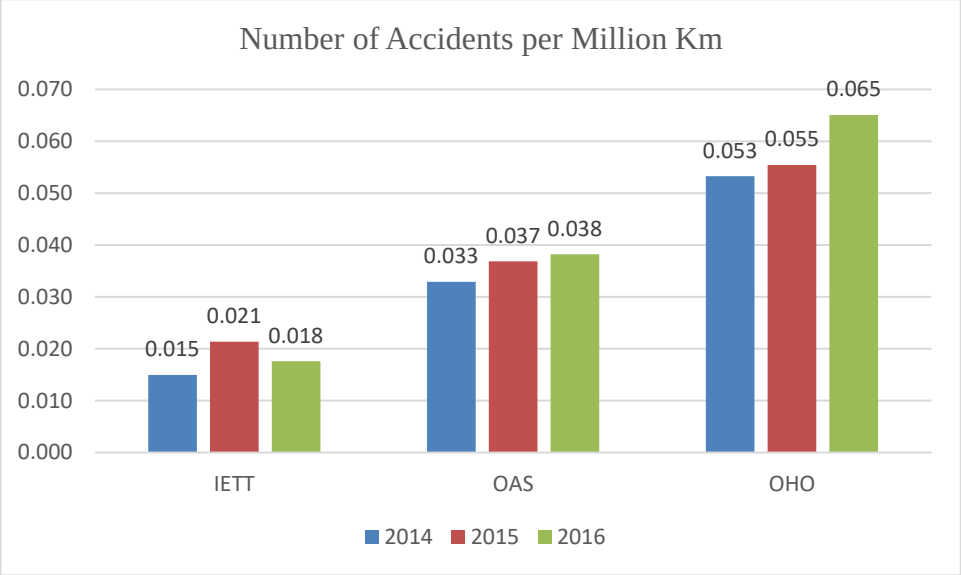


Figure 4.7 : Number of accidents per million km for IETT, OHO and OAS.

IETT's satisfaction score for comfort is remarkably much higher than those for the OAS and OHO services. The comfort level is mostly related with crowding levels inside buses. Crowding for OHO and OAS services results from two factors. First, they are already operating on the more central areas where transport demand is higher as shown in Figure 4.3. Second, due to NC contracting, their profit motive leads them to carry more passengers than acceptable comfort levels.

With regard to safety, IETT's score is again higher than those for OAS and OHO services. The safety score of OAS is higher than OHO because they possess a newer bus fleet and their drivers have undertaken professional training for defensive driving. The most important reason for the lower score of OHO and OAS services is the predatory driving styles of those operators who grab more passengers to increase their revenue and profit.

4.4.2 Agency cost-2: decreased affordability

An operator's revenue (in the current NC model) can be increased only by carrying more passengers or by increasing fares. Bus-fare elasticities are relatively inelastic in urban public transport (Paulley et al., 2006, Dargay and Hanly, 1999, Gilbert and Jalilian, 1991). Therefore, when public transport fares are increased, the total revenue increases as well. In practice, this means that the private bus and minibus operators push for fare increases in order to increase their revenues and profits. As fares are determined by the Transportation Coordination Committee of IMM, the private bus and minibus operators collectively act as associations to exert pressure on IMM to raise fare levels. The conflict of interest is in question when private operators' interest in fare increases begins to conflict with that of IMM which is expected to provide "*affordable*" mobility services as stated in the abovementioned Strategic Plan.

Having a strong influence on fare increases, private bus and minibus operators, as very powerful organised interest groups in Istanbul, can, and, as is often the case, do, jeopardise the affordable mobility provision demanded by the passengers who are the "unorganised actors" of urban public transport. This finding is supported by the logic of collective action and unorganised interests (Olson, 1971; Lowery and Gary, 2004), where the relative weight of organised groups' interests generally poses a threat to the interests of unorganised groups.

Organised groups also have a strong financial incentive to resist concessionary fares for groups such as students, disabled people, and senior people (aged above 65) since they would bear the cost of these social policies as a result of poorly adjusted compensation schemes. The cost of fare increases, brought about by the powerful influence of organised operators on fare-setting decisions, is incurred by the "unorganised" passengers. This additional cost represents a conflict with "*affordable*" mobility service demanded by IMM as the champion of citizens as passengers and imposes an agency cost on society.

Therefore, the following is proposed and examined for evidence.

Proposition 2: *The private bus and minibus operators have an incentive to risk affordable mobility for passengers in order to increase their operational revenues and profits under the NC model.*

Since private bus operators mostly operate on the more central, profitable routes fed by IETT buses that operate essentially on the social routes, they benefit mostly from the transfer fares. Therefore, one would expect more transfer fare increases compared to adult fare increases if the pressure from the side of private bus operators has a real effect on the fare setting process. This is the case according to Figure 4.8 that shows the comparison of transfer fare increases over the years 2012-2017 with adult fare increases, defined as any person not eligible for any one of the concessionary fare types. This supports Proposition 2. Except in 2017, for all price increases between 2012 and 2016, the transfer fare increase (%) is much higher than the adult fare increase (%) – variously from 6 to 11 per cent higher annually.

	Adult Fare Change	Adult Fare Increase (%)	Transfer Fare Change	Transfer Fare Increase (%)
2012	1.75 TL (US $ 0.97) ➡ 1.95 TL (US $ 1.08)	11.4	1.00 TL (US $ 0.55) ➡ 1.25 TL (US $ 0.69)	25
2013	No fare increase		No fare increase	
2014	1.95 TL (US $ 0.89) ➡ 2.15 TL (US $ 0.98)	10.2	1.25 TL (US $ 0.57) ➡ 1.45 TL (US $ 0.66)	16
2015	No fare increase		No fare increase	
2016	2.15 TL (US $ 0.71) ➡ 2.30 TL (US $ 0.76)	7	1.45 TL (US $ 0.48) ➡ 1.65 TL (US $ 0.54)	13.8
2017	2.30 TL (US $ 0.64) ➡ 2.60 TL (US $ 0.72)	13	1.65 TL (US $ 0.46) ➡ 1.85 TL (US $ 0.51)	12.1

Figure 4.8 : Comparison of transfer fare increase (%) with adult fare increase (%).

The rise in transfer prices is quite important for affordability reasons, as 13.1 % of all public transport journeys are transfer journeys (IETT Statistics Report, 2017). Transfers are an essential part of a multi-modal and integrated urban transport network (Chowdhury and Ceder, 2013). Therefore, the affordability of transfer fares should also be taken into account when analysing transport planning and policies. This is especially important in Turkey where the average household budget dedicated to transport expenses is relatively high at 18.2 % (Turkish Statistical Institute, 2016), compared to 12.9 % which is the European Union average (Eurostat, 2016). Extra transfer prices are a major contributor to transfer penalties because of extra costs on transferring passengers (Litman, 2008), which is a major concern in Istanbul's public transport fare structure.

4.4.3 Agency cost-3: increasing monitoring costs

Another institutional element that is open to creating agency costs in Istanbul's urban mobility context is the award process for licenses to both private bus (only OHO) and minibus operators. The number of licenses for OHO is fixed and set by IMM and those operating licenses give the holders the right to operate on the route for one-year (*de facto* for an indefinite time because licenses are routinely renewed each year) subject to laws and regulations. IETT, as the regulator of the private bus operators, awards the routes to operators based on their vehicle capacity. Upon the request of operators, IETT can change the routes of private bus operators.

According to the interviews undertaken with IETT experts and planners, the lack of a transparent institutional assignment mechanism creates an economic incentive on the part of private bus operators to increase their profits by changing to more profitable routes. This brings about additional monitoring costs for IETT in order to provide a fair and balanced allocation of routes to private operators.

In the case of minibuses, the licenses specify the exact route so there is less incentive for changing to a more profitable route. For OAS buses, there are defined operating areas (route bundles) in which individual bus operators can operate. In this arrangement, compared to OHO, there is less room for route change, but within defined operating areas, bus operators still strive to operate on more profitable routes. Frequent route changing of private bus operators impose some costs on passengers as well. To increase patronage, routes might be extended without regard to travel time increases.

Therefore, the following is proposed.

Proposition 3: *The private bus operators have an incentive to change to a more profitable route in order to increase their operational revenues and profits under the current NC model, creating additional monitoring agency costs as well as increasing travel time for passengers.*

4.4.4 Agency cost-4: decreased reliability

IETT is responsible for setting schedules for private bus operators and also for its own buses. This aligns with the aforementioned strategic vision of IMM that passengers benefit from "*reliable*" and timely mobility services. "Timeliness" refers to the travel

time, punctuality and regularity of services (EN 13816 Standard, 2003). Reliability refers to the actualisation rate of the scheduled trips. Private bus operators, however, have an economic incentive to carry the maximum number of passengers per trip. Therefore, the schedule set by IETT directly affects the profitability of the private bus operators. For example, very frequent headways set especially for peak times to increase both the timeliness and comfort levels of bus services can decrease the profitability of private bus operators under the NC model.

As rational economic agents, private bus operators normally have an incentive to decrease the frequency of the services so that they can carry more passengers per trip to increase fare revenue. In this way, they can also make fewer trips in order to decrease their operating expenses. Caused directly by the economic consequences of the current NC model, private bus operators' financial interests can conflict with the demands of IETT (representing passengers) of reliable, timely and comfortable mobility services.

For minibuses, on the other hand, the issue is graver because they do not have a specific schedule to comply with in the first place and so they can freely adjust their schedules to maximise profits, often to the detriment of passengers' reliable, timely and comfortable mobility expectations. This imposes high agency costs for the passengers.

Therefore, the following proposition is put forward and tested:

Proposition 4: *The private bus and minibus operators have an incentive to adjust to a more profitable schedule under the current NC model, creating agency costs for the passengers in the form of irregular, unpunctual, unreliable and uncomfortable mobility services.*

This proposition can be supported with reference to Figure 4.9 that shows the satisfaction rates (2016) from the survey on timeliness for each bus mode, including IETT, OHO and OAS. IETT's satisfaction score on timeliness is higher than OAS and OHO services. Unlike OHO and OAS services, IETT does not put a profit motive ahead of its social service obligation as a government agency. Therefore, it has less incentive to jeopardise timely services by any deliberate breach of schedule.

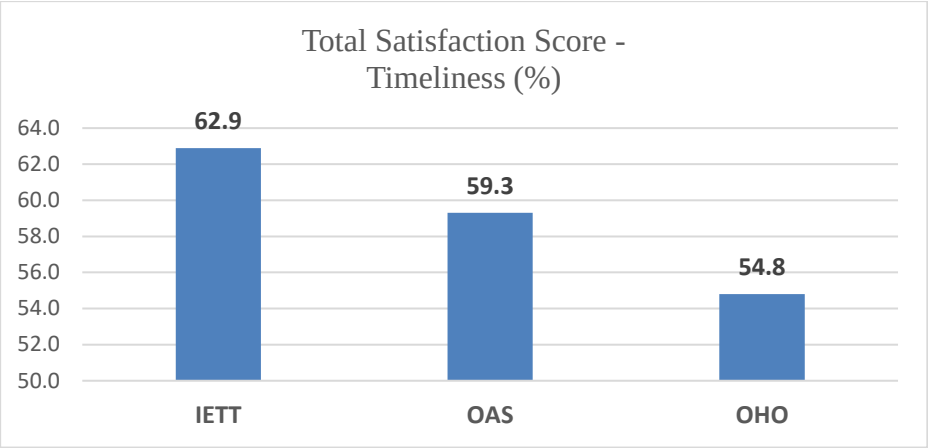


Figure 4.9 : User satisfaction rates – timeliness parameter.

Figure 4.10 further confirms the results of the satisfaction survey with the actual reliability data obtained for IETT, OHO and OAS buses. The performance of OHO and OAS, in terms of regularity, is much lower than IETT.

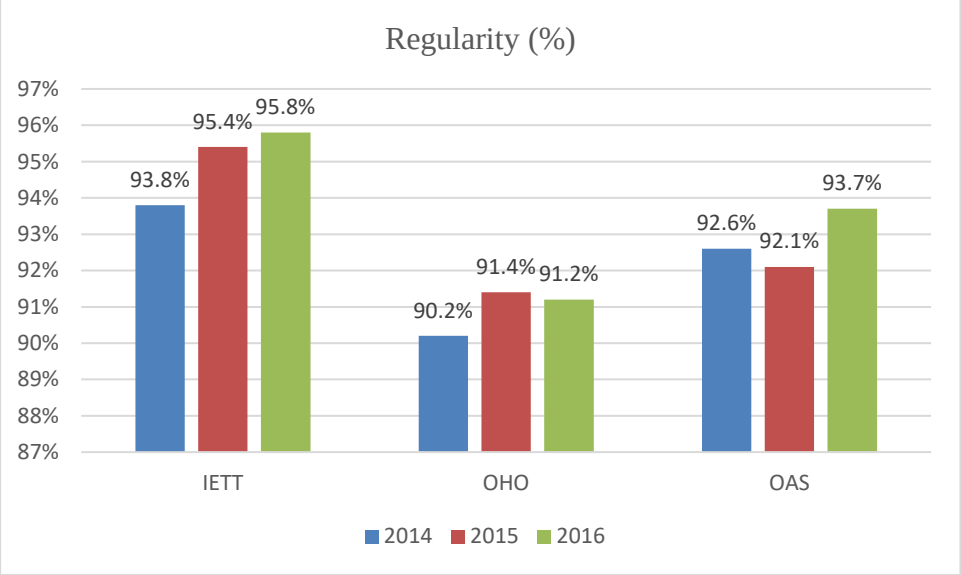


Figure 4.10 : Regularity (%) for IETT, OHO and OAS.

In addition, Figure 4.11 gives the operating cost per km and operating revenue per km values of IETT, OHO and OAS through the years 2014 – 2016 to compare the efficiency of those operators. The efficiency of OHO and OAS is considerably higher than IETT when operating costs per km (TL) and operating revenues per km (TL) are considered. The main reason for this difference is the high profitability of the routes operated by OHO and OAS so they obtain higher revenues. These operators also have lower labour costs since the drivers are paid much less than IETT and there are considerably less maintenance and administrative costs. This indicates that the key problem with OHO and OAS is low service quality rather than low efficiency. In this

paper, we focus on the agency costs having an impact on passengers in the form of lower service quality levels. It is important to keep in mind that agency costs do not denote any real costs, so they are not related with the efficiency side.

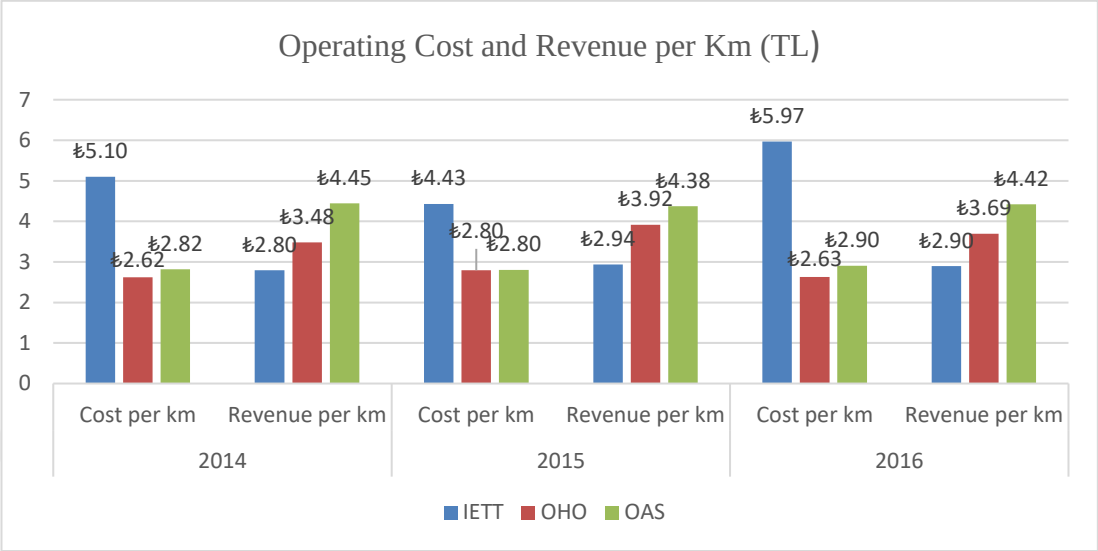


Figure 4.11 : Operating cost and revenue per km for IETT, OHO and OAS.

4.5 Can Performance-Based Gross-Cost (PrGC) Contracting Mitigate the Agency Costs in Istanbul?

To mitigate the predatory behaviour of operators and increase service quality, a GC rather than a NC remuneration model is suggested. This is because the NC model, by putting the revenue risk on the operators, causes these operators to carry the maximum number of passengers possible, that, in Istanbul, leads to serious crowding problems inside the buses.

A GC contract should also be supported with required incentives articulated as key performance indices. Aligning the profit interests of operators with service quality expectations of the passengers and local authorities can also be achieved by performance- or incentive-based contracts (Hensher and Stanley, 2003). Although an important characteristic of a PB contract is a passenger-trip based incentive payment scheme (Hensher and Houghton, 2004), its weight should be much less in a PB scheme for Istanbul, because there is already high demand for transport services.

For an efficient design of an urban mobility system, the “correct” incentives must be included in the performance-based contract (Larsen, 2001). The question for Istanbul is what should be the incentives in a possible PB contract that would make private bus

and minibus operators align with passengers' service quality expectations, and therefore achieve the socially optimum outcome and eliminate agency costs as much as possible. To put it another way, how can a "performance-based gross-cost contracting" (PrGC) model be designed for Istanbul's urban mobility system to mitigate the agency costs which have been identified in the previous section?

First, reliability is a major concern to passengers. One indicator of reliability is how closely the actual service matches the route timetable (Redman et al., 2013). For private bus services, there is a specific schedule published for the passengers. Time-based service quality indicators can be classified into two groups: punctuality; and regularity indicators (Trompet et al., 2011). Adherence to a schedule is generally measured for low-frequency routes through a punctuality indicator, whist regularity is measured for high-frequency services. Conforming to the scheduled service implies not only an on-time performance (punctuality) or a regular service (regularity), but also the actual vehicle kilometres that are delivered (reliability) (Randall et al., 2007).

Although IETT monitors punctuality and reliability figures, not only for IETT buses but also for OHO and OAS buses, these performance indicators are not included in any payment scheme and therefore are not published. One of Istanbul's problems is that private bus or minibus operators have an incentive not to operate their due services if they perceive them to be unprofitable, and they are therefore willing to incur the financial penalties. Punctuality, regularity and reliability indicators must be included in the incentive scheme in order to incentivise timely service provision. Thus, the following is proposed.

Proposition 5: *Including punctuality, regularity and reliability measures within a PrGC contract helps mitigate the agency costs of irregular, unpunctual and unreliable services as mentioned in Proposition 4, by providing a financial incentive for operators.*

GC contracts are based on service supply-based payments. In the risk allocation framework for this type of contract, the operators take the production risk and authorities take the revenue risk. The operators' profit in GC contracts does not depend on ridership. In this case, they do not have any incentive to improve their service quality. Therefore, GC contracts should also be incentivised by patronage, albeit with

a relatively small factor in order not to cause the operator to exhibit predatory behaviour. Passenger demand can be used as an incentive of measuring quality (Hensher and Wallis, 2005).

However, for developing countries where many passengers are captives to public transport, as is the case in Istanbul, passenger demand is not a good measure of quality in itself. In this case, payment per kilometre can be used as a payment unit in a GC contract. To eliminate any incentive for operators not to pick up passengers from stops, a patronage incentive must be in place.

Another implicit outcome of the GC contract model is the effect on fare setting by the Transportation Coordination Committee. As already explained, private bus and minibus operators collectively exert pressure on this Committee to raise fare levels in order to increase their revenues and profitability. However, increased fare levels conflict with passengers' demand for affordable mobility services. In a GC contract, operators derive their revenues both from the kilometres they supply and the increase in service quality as measured. Therefore, the incentive of private bus and minibus operators to affect the fare-setting process is mitigated by the GC contract model. Taking into account the above considerations, the following is proposed.

Proposition 6: *Changing to a GC contract supported by a performance-based remuneration scheme instead of a NC contract helps mitigate:*

i. *the principal agency costs of uncomfortable and unsafe services as mentioned in Proposition 1;*

ii. *the principal agency costs of unaffordable transport services due to pressures private operators exert on fare setting process as mentioned in Proposition 2; and*

iii. *the agency costs of searching for more profitable routes by private bus and minibus operators as mentioned in Proposition 3.*

This takes the revenue risk away from operators and allocates it to the local transport authority. The following formula for the remuneration of private bus and minibus operators is proposed in order to mitigate the associated agency problems and reduce agency costs:

Operating Revenue:

Service Fee {(Actual Vehicle Revenue Kilometres * Unit Price per Kilometre)}
+ *Performance Payment* {[(Number of Passengers Carried) – (Average Number of Passengers on the Route)] * Unit Patronage Payment
+ (Level of Punctuality (%) – Level of Minimum Required Punctuality (%)) * Unit Bonus Price for Punctuality [if service is a low frequency service]
+ (Level of Regularity (%) - Level of Minimum Required Regularity (%)) * Unit Bonus Price for Regularity [if service is a high frequency service]
+ (Level of Reliability (%) - Level of Minimum Required Reliability (%)) * Unit Bonus Price for Reliability}

The first part of the formula, which measures the amount of service supply due to having a GC contract, can be called a "service fee". The rest of the formula is the calculation of the performance part in the form of bonus payments for each service quality measure included. Here, the local authority can set minimum requirements for punctuality, regularity and reliability levels and the operators can be held accountable if they drop below the required service quality levels in the form of reduced payments. To eliminate the incentive of operators to carry "fresh air", a patronage incentive is added into the formula. In the language of public-private sector partnership contracting, this is analogous to an availability payment agreed to in the contract.

As an example, the effects of the above changes in remuneration can be shown hypothetically in the 11US service operating on the Asian side of Istanbul that is operated by both OHO and OAS operators. Figure 4.12 shows the route map for 11US service, whose length is 43.5 km. The 11US service is a non-frequent service and, during peak times, the majority of passengers' complaints are problems of crowding and comfort. Punctuality is measured for this service because it is defined as a non-frequent service.

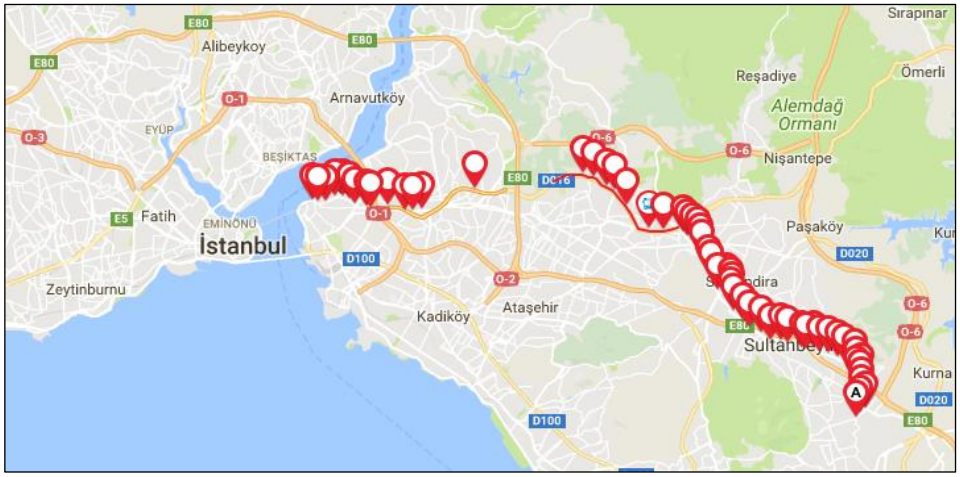


Figure 4.12 : Route map for 11US service in Istanbul, 2017.

Based on the current NC model and the proposed PrGC model, Figure 4.13 compares the average daily revenues of a private bus operator operating one bus for this service. Although the average daily number of passengers, the average revenue per passenger, the number of trips per day, the vehicle revenue kilometres per trip are real values and obtained from IETT sources, unit prices for each kilometre, unit bonus prices for regularity and reliability, actual regularity and reliability values, as well as the level of minimum required punctuality and reliability values, are assumptions for the sake of demonstrating the principles involved. The assumptions are based on the current values for IETT bus services. The target values for the minimum punctuality and reliability levels are the actual values realised by IETT. It is basically assumed that with this new remuneration model, OHO and OAS operators are expected to reach a service quality level at least that of the IETT.

NC Model	PrGC Model
Average daily number of passengers on this route: *1,024* *Number of passengers carried: 1,176* *Average revenue per passenger**: 1.46 TL (US $ 0.42) *(Average revenue per passenger is lower than adult and transfer fares, due to the predominance of concessionary fares and free passes for various passenger segments)	*Vehicle revenue kilometre per trip:* 43.5 km *Number of trips per day*: 6 *Unit price per km:* 6.58 TL (US $ 1.91) *Unit Patronage Payment:* 1 TL (US $ 0.29) *Actual punctuality (%):* 98.2 % *Level of minimum required punctuality (%):* 96 % *Unit bonus price for punctuality*: 35 TL (US $ 10.17) *Reliability (%):* 96.5 % *Level of minimum required reliability (%):* 95 % *Unit bonus price for reliability*: 40 TL (US $ 11.63)
***Average daily revenue*:** 1,176 * 1.46 TL = **1,716.96 TL (US $ 499.12)**	***Average daily revenue*:** (43.5*6.58 TL*6) + (1,176-1,024) *1 TL + (98.2 % - 96 %) *35 TL + (96.5 % - 95 %) *40 TL = **2,006.38 TL (US $ 583.25)**

Figure 4.13 : Comparison of remuneration (hypothetical example).

The PrGC remuneration model, given the assigned unit prices and performance values, does not reduce the average daily revenue to the private bus operator. The important effect would be less incentive for competition on the road for passengers, hence increased safety and comfort levels. What is important from the operators' side is that there is no loss of revenue due to the change in the remuneration model. Therefore, unit prices can be adjusted by IMM so that both operators and passengers are satisfied with the risk allocation in the new model. However, the acceptability of this new model by the private operators might be jeopardised due to reasons that are explained in the next section on policy implications.

4.6 Policy Implications and Discussion

Changing the institutional arrangements and applying the risk allocation profile implicit in the proposed model are not easy when the following three issues are considered:

i. the vested interests of private operators;
ii. technological infrastructure; and

iii. capacity-building needs of the local authority.

To begin with (i), changing the current NC model will change the financial incentives for private bus and minibus operators. The first reaction would come from operators who operate on profitable routes due to fear of losing their "acquired rights". The acquired rights are attributed to a Ministers' Council Decision, numbered 86/10553, named "The decision regarding the procedures and principles for the grant of license plates", ratified in 1986. Those private bus and minibus operators obtaining their licenses before 1986, including OHO and minibus operators, refer to this government decree as aiming at the protection of operators' rights. The new model would take away the economic surpluses generated by operating on profitable routes in the absence of objective criteria for route assignment. The current nontransparent route assignment mechanism is open to manipulation by the private operators to gain unearned economic advantages. Thus, the proposed model removes this incentive by linking the remuneration not to the number of passengers carried, but to the service level supplied.

The second challenge regarding the new contract is to set up the technological infrastructure for monitoring the punctuality, regularity and reliability of the services. To begin with, private bus operators are already being monitored by the Operations Control Center of IETT with regard to their performance of those service quality indicators. Automatic Vehicle Location (AVL) is already in place to measure the kilometres operated by private buses. Therefore, it would be easy to accurately calculate the due remuneration for private bus operators. A related challenge is setting out the criteria for performance by patronage, punctuality, reliability or regularity measures. Target setting can be undertaken by considering historical data and comparing them with that for similar bus operators. Benchmarking with peer organisations having similar characteristics is a useful way for improving performance (Trompet et al., 2017), and can be used as criteria for performance targets.

Minibuses must be included into the integrated ticketing system of Istanbul with the installation of ticket validation machines. They also need to be included into the AVL system so that their production of service kilometres can be monitored and recorded. Unlike private buses, minibuses do not operate according to a specified schedule so

currently they do not have punctuality, regularity or reliability targets despite playing a substantial role in the city's public transport system.

The third challenge comes from the capacity-building needs of the local transport authority. Performance-based payment to the private operators would require the training of the staff and a restructuring of its accounting system. In order to deal with the objections of private operators with regards to the accuracy of the payments, a special team should be trained to respond to any complaints. This requires the training of the staff about customer relationship management (CRM) within the broader context of contract administration, as well as data management techniques.

The development of a communication strategy is essential: passengers and private operators must be informed about the benefits of the new model. Both before and after the implementation of the new model, a participative environment must be created in order to adequately include all agents' interests. Workshops can be designed to collectively prepare the roadmap for the transformation before the implementation of any new system. Review committees can be formed with the participation of the representatives from private operators, passengers as well as the local government authority staff.

Policy makers should pay attention to the conditions under which institutional reform brings about unintended policy and procedural consequences (Cortell and Peterson, 2001). Policy instruments must be altered to give the reformers access to monitor compliance and sanction noncompliance with altered contracting mechanism.

Policy makers have an important role to identify the conditions that may limit the unintended policy and procedural consequences of an institutional innovation. A PB contracting model would require more than technological adaptations: it calls for a socio-cultural change to internalise the notions of performance, improvement and change (Robson, 2005; Bititci et al., 2006). Initial failure in the implementation of the new model would discourage any future institutional reforms related with performance systems for public transport.

5. TRANSACTION COST ECONOMICS OF PROCUREMENT MODELS IN PUBLIC TRANSPORT[4]

5.1 Introduction

Competitive tendering has long been an attractive procurement strategy with its promise of cost efficiency and reduced subsidies (Hensher and Wallis, 2005). From the passenger's perspective, it is also considered helpful in increasing the service quality (Beck, 2011). However, recently, its benefits have been questioned from many different angles (Veeneman et.al., 2014). While some attribute the cases of failure to procedural flaws both in design and implementation phases (Yvrande-Billon, 2006; Van de Velde et al., 2008; Walters, 2010), others have pointed out more innate problems, like erosion of trust between parties, in the concept of competitive tendering (Hensher and Stanley, 2008). Competitive tendering has been utilized to integrate the efficiency gains from private sector participation as well as sustaining government control for public service obligations (Baldwin and Cave, 1999). The studies assessing the effectiveness of competitive tendering in the literature mostly deal with institutionally developed environments where a mature public transport market as well as regulatory frameworks fostering competition exist. However, competitive tendering experience in those environments differs from those of less developed settings. Practical case examples showing the limitations of competitive tendering in weak institutional settings are not common in the literature as well.

To assess the effectiveness of competitive tendering in different institutional settings, a theoretical framework for understanding the relationship between transport authorities and service providers, or operators, is needed. The transactional relationships between operators and authorities in any public transport system occur

[4] This chapter is based on the paper "Canıtez, F., & Çelebi, D. (2018). Transaction cost economics of procurement models in public transport: An institutional perspective. Research in Transportation Economics." DOI: https://doi.org/10.1016/j.retrec.2018.03.002.

not in a vacuum, but in a particular institutional environment. Two possible institutional perspectives can be considered and utilized to delineate this institutional environment. The first one is the institutional approach developed by North (1990) which mainly deals with institutional change dynamics. The second perspective is developed by Williamson (2000) and focus on governance structures by using transaction cost economics approach. Since the role of institutional environment and transaction costs on governance structures and procurement models in public transport is the main subject of this study, Williamson's approach is preferred and used.

Using Williamson's schematization, this environment includes informal institutions like customs, norms and traditions, which constrain and encircle the institutional environment of formal rules (laws, regulations, property rights) (Williamson, 2000; Van de Velde, 2004). Formal rules are often referred to as "rules of game" by Williamson and covers the political, judicial and bureaucratic environment. Formal institutional environment surrounds the governance modality or organizational forms which include contractual arrangements, requiring the alignment of governance structure with transactions. Competitive tendering as a procurement method leads to an idiosyncratic transactional relationship between authorities and operators, different from other forms of procurement like direct award or negotiated performance based contracts (NPBC). It can be argued that the effectiveness of competitive tendering, or any other form of contractual relationship, depends on the degree to which these contractual relations are embedded in the larger institutional environment.

This schematization facilitates understanding institutional elements influencing the success or failure of competitive tendering practices. Analysing the root causes of the effectiveness of competitive tendering, as in any contractual relationship, requires figuring out how it fits with other institutional dimensions. This is especially important for studies dealing with weak institutional settings. Overlooking the institutional environment during the implementation of competitive tendering schemes is one of the primary causes of long-run ineffectiveness. The effects manifest themselves in the long run because as one moves up the ladder of institutional dimensions in Figure 2.1, time span also broadens. Therefore, initial benefits of competitive tendering may attenuate in the long run. A classic example would be the erosion of trust brought about by use of competitive tendering between the parties that causes in the long run a

gradual and irrevocable fall in the benefits (Boyne, 1998; Longva and Osland, 2007). Even though the initial high gains can be explained by winner's curse and high inefficiency of the previous monopoly in-house operator, the effects of declining trust as well as institutional misfit, due to its having an indirect role, are not easily observable and testable therefore less propounded.

In the literature, it is often taken for granted that there are already institutions conducive to free market and fair competition, including the regulations fostering the competitive environment, such as European Union (EU) Regulation 1370/07 for public transport passenger services. However, in developing institutional settings characterized by an immature public transport market, lack of a competitive environment and regulatory framework as well as inadequate government capacity to effectively monitor competitive tendering processes, direct use of competitive tendering as a service procurement method without any regard for broader institutional environment can lead to serious problems in the long run. In these cases, a more hybrid contractual forms can be better embedded in the wider institutional structure, eliminating the potential institutional misfit problems.

Istanbul's public bus transport system provides a good example for a hybrid procurement regime which combines elements from tendering, direct award as well as negotiated performance based contracting models. Istanbul's public transport system includes bus, rail and maritime transport modes and until recently it was only composed of municipal in-house public bus and rail operators which are directly awarded and a large paratransit (minibuses, school and company shuttles, shared taxis etc.) transport sector. Until 2011, bus sector was composed of IETT, directly awarded municipal in-house public bus operator which operates for more than 140 years and Private Bus Operators (OHO, in Turkish), an association of individual bus operators, with a fleet of 2,153 buses, operating commercial services on the basis of operating permits, or licences. In 2011, a new public subsidiary company, called Otobus AS (OAS), was established under Istanbul Metropolitan Municipality (IMM), whose role is to organize competitive tendering procedures to award concessions to private bus operators. The main aim of IMM, which is the public transport regulator and authority in the city, was to increase service quality and cut costs and subsidies given to IETT. The results of the scheme were quite positive initially, with reduced subsidies, renewed

bus fleet and increased service quality. However, after 6 years of operation, private bus operators of OAS indicate signs of stagnation in terms of service quality and user satisfaction. The institutional factors leading IMM to establish OAS rather than employing a full-fledged competitive tendering scheme will be discussed in this paper. We will highlight the institutional elements facilitating or hindering the adoption of complete competitive tendering, in a developing institutional environment.

In this paper, the questions below are addressed both theoretically by benefiting from Transaction Cost Economics (TCE) approach as well as practically by examining the challenges Istanbul face, using case study method: why is it sometimes beneficial to have competitive tendering and better to have internal production or other long-term contracting choices at other times? How do the features of the transactions between operators and authorities affect the choice of governance form? Which transactional features are more facilitating for competitive tendering? For weak institutional settings, which institutional elements do affect the efficient selection of procurement types? Is there an alternative way, e.g. better contract design or legislative amendments, that can provide a procurement type with better transactional cost economizing properties? The advantage of case study method is that it can focalize on real life problems and test different opinions about the phenomena at hand as they unfold in practice (Flyvbjerg, 2006) and get a deeper understanding of the issue at hand (Grosvenor, 2000). A sociological perspective about embeddedness is also supplemented to the neoclassical economic analysis, especially when we elaborate on the informal institutions which shape the selection of procurement methods. Istanbul's case is analysed in depth and its context is scrutinized to better facilitate our understanding of how institutional setting and transaction costs influence the implementation of any procurement type. Theoretical propositions are developed throughout the paper to generalize our findings.

5.2 Theory for Authority Operator Relations and Transaction Cost Economics

In recent years, competitive tendering (CT) has become more and more favourable procurement type for public transport service provision around the world to foster competition, and reduce subsidies and unit costs. By introducing competition for the market where competition in the market is not possible, efficiency is expected to increase (Demsetz, 1968). Although cost advantages have become almost indisputable

in the initial tenders, later cost savings and passengers' satisfaction are far from certain (Filippini et. al., 2015). There are many crucial factors that must be taken into account during the design phase of CT such as institutional factors, competitive environment, organizational features etc. (Nash and Wolanski, 2010). We can also argue that transaction costs are an important factor influencing the success of CT schemes. In authority operator relations, transaction costs are mainly the information and search costs for operators, bargaining costs, as well as monitoring and enforcement costs of contracts. The most appropriate criterion to select a procurement method for public transport service delivery is the total social cost, which can be defined as the production and transaction costs of a project (De Schepper, 2015). Transaction costs in the ex-ante evaluation of contracts is significant due to potential reduced cost savings (Dudkin and Välilä, 2005). The study of transaction costs cannot be separated from the study of governance, because the latter is concerned with "the identification, explication and mitigation of all forms of contractual hazards" (Williamson, 1999), and also concerned with the institutional arrangement where transactions are negotiated and realized. Therefore, we need to analyse the institutional environment together with the organizational forms, or governance structures, to be able to give a proper account of transaction costs of procurement types including competitive tendering.

Introduction of competitive tendering changes "the rules of the game" (North, 1990), therefore need the transformation of institutional elements like culture, market organization, norms, legislation, property rights and policy frameworks. These elements all have an influence on the transaction between operators and authorities. Designing a competitive tendering program for new adopters of this model in weak institutional environments requires a deep analysis of the nature of transactions between public transport operators and public transport authorities. Transaction cost economics (TCE) is useful to understand these transactions taking place in a particular governance structure between actors. TCE approach provides an important perspective, to better illuminate the characteristics of the transactions taking place between public transport operators and authorities. This approach regards the transaction as the central unit of analysis and points out that comprehension of transaction cost economizing is crucial for the study of organizations by evaluating to what degree their governance structures help economizing on these transaction costs

(Williamson, 1981). Therefore, the question of whether competitive tendering is a procurement type which have better transactional cost economizing properties than other procurement types can be better addressed by TCE approach.

Van de Velde et al. (2008) classify the governance structures in the land passenger transport sector as in the following:

i. In-house operations,
ii. Route contracting under competition,
iii. Network contracting under competition,
iv. Free market initiative with additional contracting.

In terms of transaction cost economizing efficiency, procurement types and governance structures are closely related. A direct award mechanism can be regarded as more transactionally cost efficient for the procurement of an in-house municipal operator because other procurement types brings redundant transaction costs. Route contracting under competition can be more transactionally cost efficient under a competitive tendering regime than negotiation regime because of more certain and definite service design environment. On the other hand, network contracting under competition is likely to be more transactionally efficient under negotiated performance based contracts because of increased complexity, hence increased need for negotiation and close collaboration. Lastly, free market initiative requires partial contracting where market forces are not sufficient for delivering social services; whose procurement type can be characterized by free market and partial competitive tendering. Table 5.1 shows the transactionally efficient procurement types for different governance structures or organizational forms:

Table 5.1 : Relationship between governance and procurement types.

Governance Structure (Organizational Form)	Procurement Type
In-house operations	Direct Award (DA)
Route contracting under competition	Competitive Tendering (CT)
Network contracting under competition	Negotiated Performance Based Contracts (NPBC)
Free market initiative with additional contracting	Free Market and Partial Competitive Tendering (PCT)

Any kind of transaction, including authority and operator relations, can be characterized by the following elements: asset-specificity, uncertainty and frequency (Williamson, 2005). In case of high environmental uncertainty, high asset specific

investments which are not easily transferable to other initiatives and frequent relationships, transaction costs are higher and it is more efficient for this kind of transactions to occur in a vertically integrated governance structure, e.g. in-house operations (Hensher, 2010). Institutional environment is crucial in influencing the magnitude of transaction costs. For example; in weak institutional settings characterized by low level of trust, social capital, ineffective regulation, weakly defined property rights and uncertain political and economic climate, one can expect the transaction costs to be higher, calling for vertically integrated modes of production (Merkert, 2013). Therefore; transactions costs are affected by both internal transaction characteristics and external institutional elements, which can also be called shift parameters (Williamson, 1991).

Main characteristics of institutionally strong public transport settings can be listed by using the institutional levels illustrated in Figure 5.1:

i. Informal institutions: high levels of trust and social capital among the economic actors, shared norms and customs, common political vision, efficient partnership and cooperation culture;
ii. Formal institutional environment (rules of the game): effective regulations, competitive and contestable markets, appropriate intervention mechanisms in case of market failure, well defined property rights, public transport legislation and legal framework, clear policy preferences and strategic direction;
iii. Institutions of governance structure: competent regulators and authorities, effective organizational forms, clearly defined organizational roles and responsibilities, flexible and agile organizations (operators, regulators, authorities etc.);
iv. Contractual arrangements: professional contracting and tendering mechanisms, effective monitoring of contracts, optimal risk allocation, clear remuneration rules, effectively-structured incentive alignment.

Transaction costs are inversely related to institutional maturity. On the other hand, transaction costs are directly related with transactional characteristics; which means that higher asset specificity leads to higher transaction costs, and the same goes for uncertainty and frequency level. Moreover, governance structures, or organizational forms, are influenced by the magnitude of transaction costs, which in turn influence the procurement type. Procurement type is related back again to transaction costs. For example, a selected procurement type, say competitive tendering, can trigger the rise of transaction costs, the magnitude of which might lead to considering other

procurement types, DA or NPBC. Therefore; we can indicate this causal relationship as in Figure 5.1:

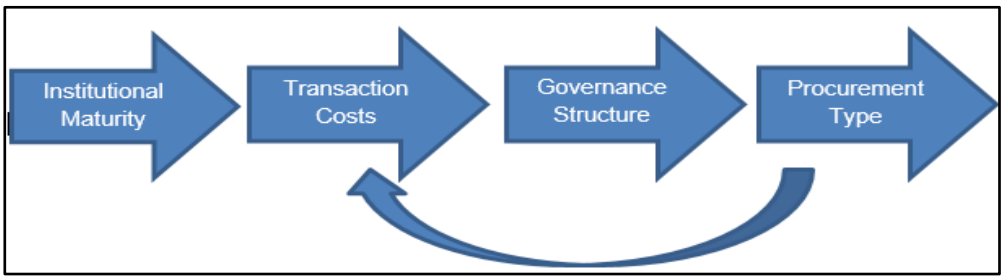


Figure 5.1 : Causal relationship for institutional maturity.

As transaction costs increase, in-house operations or negotiated contracts become more transactionally cost-efficient procurement forms. Negotiated contracts are more efficient if the institutional maturity is higher, providing a trust based environment for the transactions; e.g. public air services (Merkert and Hensher, 2013). On the other hand, as transaction costs decrease, market based procurement types, either competitive tendering (competition for the road) or complete free market with partial contracting (competition on the road) schemes become the transactionally cost economizing procurement types. In the absence of a strong institutional setting where appropriate intervention mechanisms in case of market failure do not exist, competitive tendering rather than deregulated free market is more likely to be a better option since contracts can better regulate the uncertainties of the weak institutional environment. Figure 5.2 summarizes our arguments:

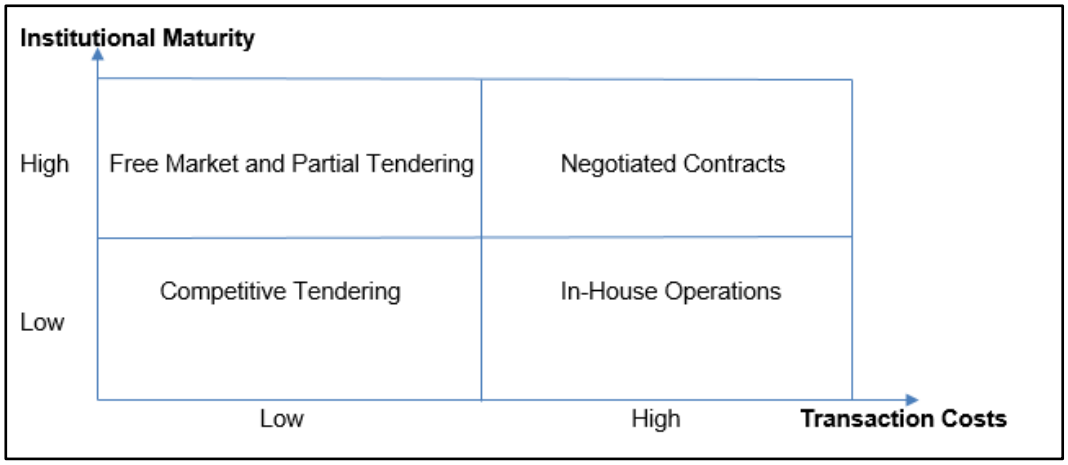


Figure 5.2 : Institutional maturity, transaction costs and efficient procurement types.

The above framework can be helpful in understanding many governance and organizational issues in public transport systems: In which institutional environments

are certain procurement types not efficient and need review? Why does institutional maturity matter when it comes to selection of optimal transaction cost economizing organizational form and procurement type? Are negotiated performance based contracts an efficient way to procure public transport services in an institutional setting where there are a lack of shared norms and spirit of partnership and cooperation as well as low trust? This figure facilitates our grasping the interrelationship between institutional maturity level, transaction costs and procurement types in public transport systems. It can also help us comprehend the underlying reasons for the failure or under-performance of competitive tendering as a procurement type in certain cases, by employing a broader institutional perspective.

Competitive tendering can be regarded as a contracting mechanism that can discourage trust between operators and authorities (Hensher and Stanley, 2008; Hensher and Wallis, 2005; Stanley et al., 2007) and it can be argued that NPBC as a procurement type can provide a solution to this problem (Eerdmans et al., 2010). This framework suggests looking at the institutional setting for whether trust level is sufficient to accommodate a NPBC, before deciding on a possible change of procurement type. If not, then initial institutional misfit can cause further problems unless necessary institutional arrangements are in place to support a NPBC. Although one must also consider production costs related with each procurement type to make an efficient decision, we limited ourselves in this paper to the analysis of transaction costs between operators and authorities. In the following section, we will give a case study of Istanbul's public bus system to support our theoretical arguments.

5.3 Evolution of Istanbul's Public Bus Transport System and Institutional Environment

With a population of nearly 14.6 million people and a metropolitan area of 5.343 km^2, Istanbul is the most populous and densely populated city of Turkey as well as being the economic, cultural and historic center of the country. Istanbul is a transcontinental city connecting Europe and Asia, with Bosphorus Strait separating those two parts. Istanbul is also one of the most populous cities in the world, ranking as the 7^{th} largest city and the largest European city. Istanbul has one of the fastest growing metropolitan economies in the world and accounts for more than 30.5 % of Turkey's GDP (TSI, 2014). As a result of the rising population, Istanbul has to cope with increasing

mobility and traffic problems. The number of registered private automobiles in Istanbul has almost multiplied tenfold since 1980, reaching 2,146,257, which means nearly 150 private automobiles for every 1,000 people. Although Istanbul is still at its early stage of automobile ownership, under current trends, car ownership is expected to rise radically with the increased trip rates for the next decades (Alpkokin et al., 2016). Public transport system in Istanbul is managed and regulated by Istanbul Metropolitan Municipality (IMM) according to both social and commercial imperatives. It comprises a bus and bus rapid transit (BRT) network, various rail systems (underground metro, light rail, tramway, funiculars), maritime services as well as paratransit modes like minibuses, taxis and shuttle services. Table 5.2 shows the modal share and organizational structure of public bus and paratransit transport market in Istanbul:

Table 5.2 : Market organization of bus and paratransit transport system.

Modal Type	Operator	Initiative	Procurement Type	Form of Ownership	Number of Vehicles	Modal Share (%)
Bus	IETT	Authority	Direct Award	Municipal Public Operator	3.030	17,9
	OHO	Market	Free Market, Licences	İndividual Operators	2.154	14,9
	OAS	Authority	Competitively Tendered Concessions	Individual Subcontractors	985	8,2
Minibus	Informal Paratransit	Market	Free Market, Licences	Individual Operators	6.460	21,7
Shuttle	Informal Paratransit	Market	Free Market, Licences	Individual Operators	66.000 (approx.)	24,8
Taxis and Shared Taxis	Informal	Market	Free Market, Licences	Individual Operators	17.000 (approx.)	12,5

As can be seen from the table, Istanbul's public bus transport system is dominated mostly by individual operators (82.1 %), running their services on a partially regulated free market initiative basis. Only buses provide scheduled services, which make up 41 % of all local bus transport modal share. Istanbul's rail network, operated by a directly awarded in-house municipal operator, Metro Istanbul, covers tram, underground metro, light rail and funicular modes, which complements land passenger transport with its 156 km of rail network. IMM plans increasing this rail network to nearly 450 km until 2019, and it is expected to become the backbone of the urban transport, as other modes will be redesigned to feed this main rail network. This decision to change

to a rail-based public transport system is taken to prevent the problems of bus services, mainly caused by service quality problems of market-based deregulated services and high operational costs of in-house municipal operator, IETT. Different transactional relationships between bus operators and IMM, the transport authority, depending on the procurement type, play an important role in the service quality and operational costs. Using the theoretical arguments developed in the previous section, we will now elaborate on the contextual relationship for each bus operator group between transaction costs, institutional environment, procurement type and service effectiveness and efficiency all of which shape the policy options and institutional evolution of urban bus services in Istanbul.

Istanbul's institutional setting regarding urban bus services can be characterized as a weak or developing one due to a number of reasons. First of all, there is a lack of competitive and contestable urban bus transport market. The predominance of individual operators hinders the development of a professional and corporate urban bus transport operator market. On the other hand, property rights of individual operators are not well-defined. For example, operating licences given to OHO operators are regarded as a form of acquired rights by the legal authorities, which blocks the design of more effective contractual mechanisms. In that sense, lack of a public transport legislation prescribing the contractual mechanisms, competition rules and roles and responsibilities of mobility actors is another factor that decreases the maturity level of institutional environment. Lack of a competent and professional transport authority which would plan and coordinate the public transport modes also hampers the design of effective contractual solutions. Therefore, Istanbul's experience presents important insights for the developing public transport institutional settings.

5.3.1 Directly awarded municipal in-house operator: IETT

As the monopoly public bus operator of Istanbul until 1983, IETT had operated as a utility company providing bus, electricity, tram and manufactured gas (later natural gas) services from 1875 onwards. Having served as a source of cross subsidization for transport services, electricity and gas services were privatized, leaving transport services dependent on IMM subsidies. After 1983, individual private bus operators (OHO) entered the urban bus transport scene, running based on authorized licences giving them de facto indefinite route concessions mainly on commercial routes. The

main reason of the introduction of OHO was to meet the immediate transport demand of rapidly growing urban areas, by benefiting from market forces. In order to open the market for private bus operators, IETT gradually started to withdraw from commercial services, serving mainly on non-commercial services. Besides providing social (non-commercial) transport services, regulation and monitoring of OHO were given to IETT. Given the low institutional maturity of Istanbul's public transport environment, resulting high transaction costs could only be accommodated by having a directly awarded in-house municipal operator, IETT. From a TCE and institutional perspective, choosing a direct award procurement type seemed the most efficient option for the transport authority, IMM (see Figure 4.3). However, as the urban mobility context changed rapidly with the radical transport demand increase due to huge influx of immigrants from other cities from 1980s onwards, IETT became insufficient as well as economically inefficient to provide those services as production costs increased rapidly, which put a heavy financial burden on IMM. In this context, opening of the bus operations for free market initiative became the only economically efficient option for IMM to provide immediate public transport services. We now move on to the analysis of OHO services from a TCE and institutional perspective.

5.3.2 Free market initiative: OHO

OHO, standing for "Private Bus Operators" in Turkish, is an association of individual bus operators, running its services based on licences authorized by IMM in order to meet the immediate transport demand from rapidly growing urban areas. IETT is responsible for monitoring, scheduling and quality auditing of OHO services. Even though they get licences for operations which give them operating permit for one year, after many years of operations, they now have de facto indefinite operating permits, renewed each year and recognized in the form of "acquired rights" by the current legal acts. Looking at Figure 5.2, free market option is the most efficient procurement form when the institutional maturity is strong enough to accommodate this transactional relationship where transaction costs are low. Opting for a free market service provision by OHO services when institutions were not mature to accommodate this type of procurement in a high transaction cost environment resulted in poor service quality due to institutional misfit, caused by insufficient institutional capacity to successfully manage the service quality problem of OHO services. Initial benefits of OHO services

in the form of increased patronage and meeting immediate mobility needs of rapidly rising population had been outweighed by the increasing transaction costs of monitoring, regulating and enforcement costs.

The main service quality problems of OHO services were crowding, predatory behaviour on streets and comfort problems inside the buses mainly because of their purely commercial outlook in service provision by trying to carry the maximum number of passengers per trip without much regard for service quality. Besides reduced service quality, this form of procurement brought about a substantial transaction cost for IETT in the form of higher auditing, monitoring and enforcement costs and increased the need for subsidy from IMM. Backed by legal protection of their acquired rights, OHO operators continued providing bus services as long as their profitability is not affected. Although penalties were in place in case of breaking service provision standards, if ticket revenues compensate these penalties, from a commercial perspective, they continued operations. Moreover, the service provision standards were not designed from a quality perspective and only defined minimum criteria for operations. Low service quality levels together with increased transaction costs led IMM to develop a more hybrid solution to the procurement problem. As mobility demands keep rising and rail investments take years to complete, the dilemma faced by IMM is to decide whether to expand IETT's regular bus services which would bring less transaction costs but substantial investment and operational costs or to issue new licences for entry to OHO operators which would cost much less in terms of production costs but a lot in transaction costs and additionally low service levels. OAS, with its novel and hybrid procurement type, came into picture in 2011 to resolve this dilemma.

5.3.3 A hybrid procurement model of OAS

OAS was established in 2011 under IMM as an awarding agency to issue tenders for new concessions. A novel contracting model is developed which would tackle the problem of high production costs of IETT and high transaction costs of OHO. In this contracting model, OAS procures only vehicles and drivers through competitively tendered area based concessions. Service planning at tactical level is done by OAS, subject to IMM's approval, and operators undertake the production costs, including vehicle investment and operational costs (fuel, staff, maintenance etc.). The tender

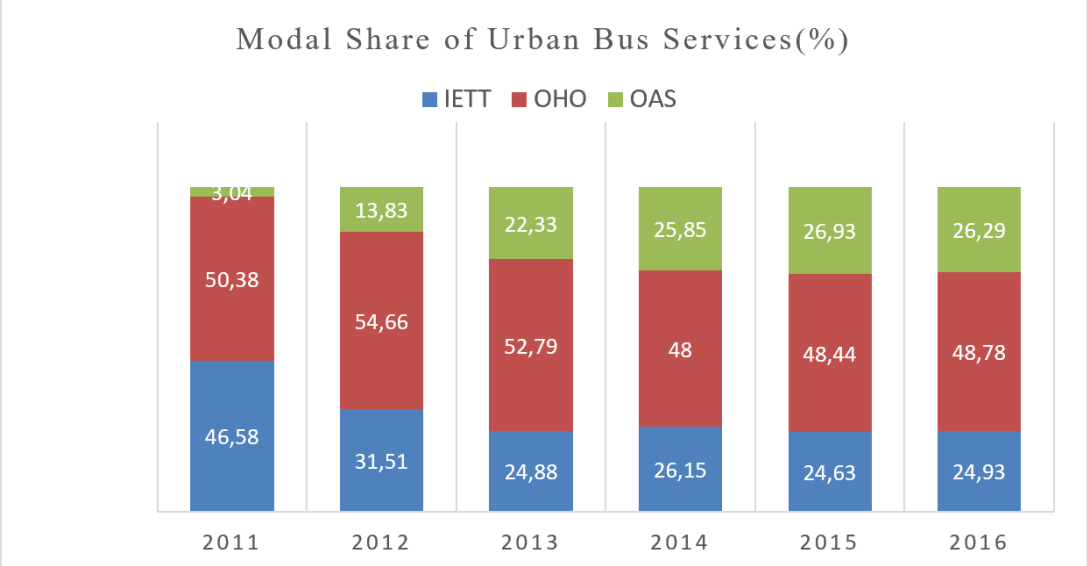
gives them the right to operate in pre-defined operating areas for 15 years, subject to the service standards specified in the contracts. Operators are mostly composed of individual vehicle owners or subcontractors. These individual operators work on a rotation basis in the defined operating area so that each operator runs its services on predefined routes on an equal basis. This practice is implemented with a view to prevent predatory street behaviour exhibited by OHO operators. All ticket revenues from a particular operating area are collected in a common pool resource and then distributed to the operators according to the following criteria with associated percentages:

i. Revenue Kilometre (60%)
ii. Patronage (30%)
iii. Performance (10%)

This revenue sharing model supported by the rotation of operators over the routes is developed to eliminate the service quality problems of OHO buses explained above. Revenue kilometre is the main revenue driver in order to cover the incurred operational costs, which are proportional to revenue kilometre. The relatively low weight of patronage incentive aims to increase the patronage level, but in a way to reduce the predatory behaviour exhibited by OHO. Performance incentives are calculated on a malus basis where predefined points are deduced for each noncompliant act of the operator. Noncompliance includes violation of service standards (lost trips, unpunctual or irregular services etc.), traffic rules and vehicle standards (cleanliness, breakdowns, air-conditioning etc.) as well as complaints from users. In case of full compliance, the operator gets all the due performance payments without any deduction. This performance based revenue sharing model is designed to increase the service quality and patronage in a way that discourages the pure commercial outlook of OHO which brings about crowded buses, predatory street behaviour as well as low interior comfort levels.

Operators in this model carry both production and revenue risks, fitting the definition of net-cost contract, yet supported with an incentive based scheme to foster patronage and service quality performance. Concessionary fare support is provided to operators to compensate for their revenue loss. Another major difference with OHO is the issue of acquired rights. While operators of OHO do not pay for the concessions due to acquired rights, OAS operators pay the bid price for concessions to OAS, which

utilizes the collected revenues from bids as well as from service fees which are deduced from common revenue pool for further reinvestment in public transport services (stations, parking depots, driver training facilities, maintenance garages etc.). On the other hand, this procurement model has lower operational costs compared to IETT services. Service design is carried out on negotiated basis between IETT and OAS operators. That is why, this model can be classified in a NPBC procurement type. IMM has gradually increased the modal share of OAS operators in the bus market, as can be seen in Figure 5.3:



	2011	2012	2013	2014	2015	2016
Total Bus Patronage (millions)	712,1	858,2	902,6	968,8	949,6	974,3

Figure 5.3 : Modal share (%) and overall patronage of bus market.

With the introduction of OAS, the bus market expanded from 712.1 million to 974.3 million passengers per year, since passengers mainly from paratransit modes (minibuses, shuttles, shared taxis etc.) started to prefer regulated bus services besides the natural increase of population and mobility demand. From a service quality perspective, OAS services initially introduced new vehicles which helped increase the user satisfaction rates, measured annually by customer satisfaction surveys, as can be seen in Figure 5.4. However, later satisfaction rates of OAS have shown a steady trend. The introduction of OAS in place of mainly IETT services led IETT to adopt a more competitive outlook of its services to convince IMM of its service quality, which resulted in adoption of Total Quality Management (TQM) perspective. This brought about a radical increase in user satisfaction rates over the years, from 58 % to 66.2 %.

This outcome is consistent with the idea that the rise of competitiveness within public transport systems leads to a higher service quality. On the other hand, service quality of OHO has kept deteriorating over the years although its overall modal share has not changed so much because of captive passengers. The service quality increase in other bus operators has also led to a relatively lower perceived quality of OHO services in the minds of users.

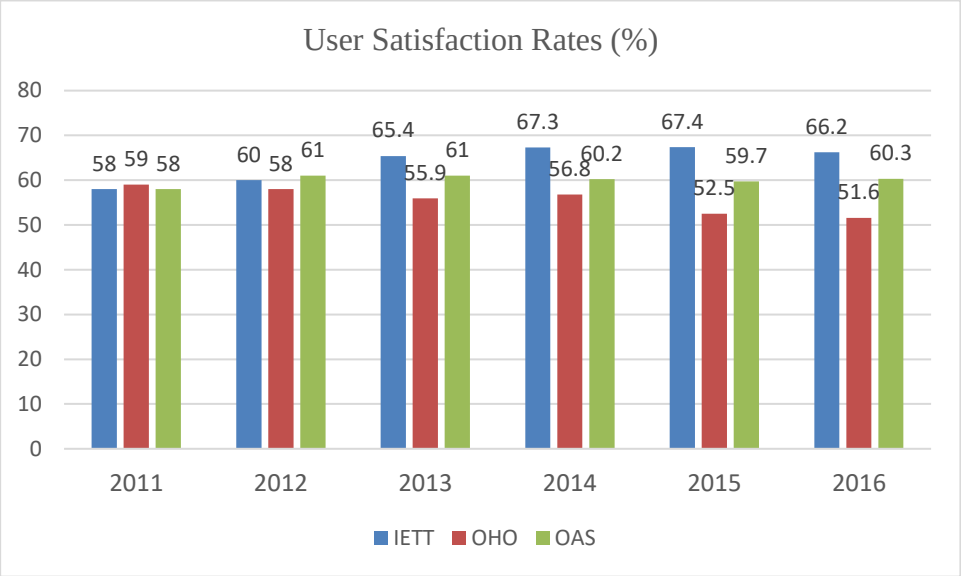


Figure 5.4 : User satisfaction rates (%) of bus market.

From a transactional perspective, OAS model was designed to constitute a middle ground in terms of procurement type between directly awarded IETT services and free market OHO services. Apart from rotation model, service design and tactical planning issues were not specified in detail in the contracts with subcontractors and left to negotiation between OAS and its subcontractors. The main reason for this negotiation based relationship was to increase service planning flexibility of OAS services, in order to catch up with changing mobility patterns and demands. A route based contracting model with constructive specification of routes, timetables, information etc. (Van de Velde et al, 2008), would be quite ineffective from users' perspective since mobility patterns change quite fast in Istanbul's context which necessitates a more network-based negotiated contracting model that would take unpredictable future contingencies in to account. However, negotiated performance based contracts require an institutional environment where trust and shared goals as well as a regulatory framework for fair competition should be present between parties.

There was, and has still been, a lack of regulatory framework to regulate the competition between OAS, OHO and paratransit operators, all of which operate on a commercial basis and carry the revenue risk, though in a more indirect way in OAS case. The routes on which OHO buses operate are not exclusive, and OAS as well as paratransit operators can also operate on these routes, which opens the way for predatory behaviour to "grab" more passengers. Carrying a passenger for one operator means less potential ticket revenues for another operator running on the same route, which leads to a zero-sum game situation where one operator's gain is equivalent to another's loss, from the commercial perspective of operators. The revenue sharing model of OAS was developed to curb this effect, however, gradual decrease in cost coverage ratio over the years led the operators to adopt a more predatory behaviour. Remember from Figure 2.1 that contractual arrangements between operators are at the 4th level of institutional dimensions which must be well embedded within the upper dimensions. Therefore, the lack of institutions to secure fair competition "on the road" brought about an environment where operators jockey for more passengers to increase their revenues, often violating service quality concerns. Now, we will elaborate on the lessons drawn from Istanbul's experience to arrive at a more general understanding of the relationship between transaction costs in authority and operator relations, institutional environment and procurement types.

5.4 Discussion and Policy Recommendations

What we argued throughout this paper, first as a theoretical insight and then supported by a case study of the institutional evolution of Istanbul's urban public bus transport system, was that the effectiveness of procurement types, including direct award, competitive tendering, negotiated contracts and free market initiatives, to a large degree, depend on the embeddedness of these forms within the institutional environment. Although this proposition might seem obvious, what is more important is to get an understanding of the dynamics between institutional elements and procurement types, which are closely related with the governance structure at hand. This is particularly important if one tries to deal with the weak institutional settings. Experience of competitive tendering and other contractual practices in strong institutional environments offers little help if one overlooks how institutional dimensions and elements influence the transactional environment between operators

and authorities in weak institutional settings. Although the importance of a well-designed regulatory framework is addressed as an important success factor for competitive tendering in the previous literature (Hensher and Wallis, 2005; Yvrande-Billon, 2007; Hensher and Stanley, 2008), to our knowledge, an institutional account of the relationship between transaction costs and procurement models in weak institutional settings has not been proposed. By conceptualizing the transaction costs as a function of the institutional maturity, we tried to relate the institutional factors, by benefiting largely from Williamson's schematization of economics of institutions and TCE view, to the selection of procurement types and organizational forms. Unveiling the underlying processes lying behind the relation between institutional environment and procurement types facilitates our understanding of the reasons for the success or failure of different procurement types. Istanbul, in this respect, provides a quite appropriate experimental field for this purpose, due to its having a diverse spectrum of different procurement types as well as its having a comparatively weak institutional environment.

Starting from OAS experience, which can be regarded as an example of negotiated performance-based contract, institutional factors, from the outset, played a determining role in the selection and effectiveness of this contract type. Being a hybrid procurement form combining competitive elements and negotiation principles which are different from standard competitive tendering practices around the world, OAS model initially offered an increase in service quality. However, in the absence of a comprehensive framework for setting the rules for "on the road" competition with other operators, revenues fell short of cost increases and OAS operators started to behave, commercially, like OHO operators, which was just the opposite of IMM's intentions at the design phase. The crucial thing here is not to ensure the institutional embeddedness or fitness of the current contracting model. Without clearly defined property rights of the market players, insufficient regulatory framework and lack of trust between authority and operators, new model seems to fail to deliver the initial high expectations. Given the gravity of arising problems, decline of currently stagnating user satisfaction rates in the future is not unlikely.

In terms of service quality delivery, failure of OHO can also be attributed to the same institutional misfit problem. Weakly defined property rights of OHO licences, in this

case, played an important factor. During the rapid urban growth period, they filled a very important gap in public transport service delivery. However, their financial sustainability has gradually worsened due to rising operational costs and increasing competition from other modes and operators. This might not be a problem if the issue were just to be a case of business failure. Private bus operators, as well as minibus and taxi operators, are all regarded as small and medium sized enterprises (SMEs) and protection of these operators is strongly supported as a policy preference, which is another major institutional element of the public transport context in Istanbul. Financial threat to the vested interests of these operators is not just an economical issue, but a social and political one. In the absence of a satisfactory funding framework or mechanism, another institutional factor, to subsidize those services, the private operators are largely left on their own to economically survive, which brings about predatory behaviour to increase their revenues. Therefore, one should keep in mind the social and political significance of SME sort of operators in weak institutional settings before proposing a standard competitive contracting model as a solution. These SME operators are so much embedded in the socio-political institutional setting of Istanbul's public transport landscape that developing a contractual solution between operators and IMM without taking into account their place in the system is not possible. This is actually the crux of the problem which acts as a major hindrance to any institutional reform attempt. All these arguments suggest strongly that the best transaction cost economizing mode of procurement and organizational form in weak institutional settings seems to be directly awarded in-house operations, which can be supported by the relatively high and rising user satisfaction rates of IETT services, from a service quality point of view.

With its high transaction cost and not so strong institutional environment, Istanbul's public transport system can be positioned at the lower-right corner of the framework developed in Figure 4.3, which calls for directly awarded in-house operations, like IETT. OHO, with its free market procurement model, should be located at the upper-left corner, and OAS, with negotiated contracts, should be located at the upper-right corner. Only IETT seems embedded in the institutional environment according to this framework, which is supported by higher user satisfaction scores. OHO embodies the highest institutional misfit, therefore leads to decreasing user satisfaction score over time. OAS model is positioned properly in transaction cost axis; however, it requires

higher institutional maturity. The stagnant satisfaction scores over time reflect the results of relative institutional misfit in terms of perceived service quality. Figure 5.5 shows the current and suggested (with arrows) places of OHO, OAS and IETT models on the framework that we developed in Figure 5.2:

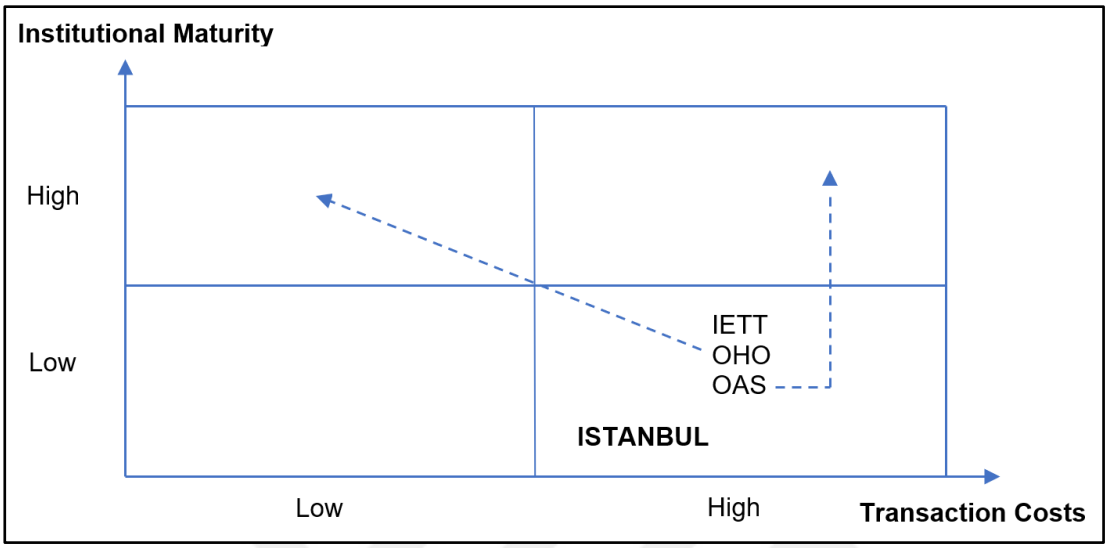


Figure 5.5 : Locating OHO, OAS and IETT on institutional maturity-transaction cost matrix.

6. SELECTING AN OPTIMUM CONTRACTUAL PAYMENT MODEL [5]

6.1 Introduction

Management and organization of public transport have been going through a reform in recent decades, both developed and developing countries joining this trend. A key focus is on providing public transport services in a cost-efficient manner and increasing service quality or effectiveness. Different ways to achieve these objectives have been proposed and implemented, including deregulation, privatization, competitive tendering and various forms of contracting, depending on the context (Hensher et al., 2013). Contractual practices can take different forms in the way regulatory powers are assigned by transport authorities, financing arrangements, the structure of ownership between public and private parties and the way the relationship is defined between transport operators and authorities (Pedro and Macario, 2016). Although contracting is the main trend in many cities, some of the developing cities still continue with concession-based models. Although these models are different from contracting or tendering based service procurement models, the problems are similar due to the similarity of the parties' expectations.

Accommodating different objectives of the parties, whether they are commercial or social, requires taking a more holistic approach (Hensher and Macario, 2002). An overall public transport system should satisfy different needs and demands of the actors; passengers, authorities and operators. Whereas transport operators seek to maximize their revenues and profitability, passengers demand a high-quality service in terms of reliability, affordability, comfort and availability. Transport authorities, on the other hand, try to reduce the subsidies paid to the operators. Finding an optimal contractual type which can satisfy different parties' demands has recently been an

[5] This chapter is based on the manuscript "Canitez, F, Çelebi, D., Deveci. M., Kuvvetli, Y. (2018). Selecting an Optimal Contractual Payment Model in Public Bus Operations Using a Non-Linear Mathematical Programming".

important problem in many countries (Hooper, 2008). Although there are different components of a contractual relation like contract area, duration, the selection mechanism (competitive tendering or negotiated contracts (Hensher and Wallis, 2006)); payment or remuneration model is an integral part of contractual relations between transport operators and authorities. The payment model can change the incentives of the parties by changing their risk allocations, hence leading to different performance outcomes. Net-cost, gross-cost, performance-based contracts, cost-plus and commercial payment models are commonly used in urban public transport sector (Wallis, 2005) (see Section 4). Other frameworks are also provided in the literature (Stanley and van de Velde, 2008; Macario, 2008). The selection of an optimal payment model is a complicated problem, the solution of which depends on the local setting.

One of the most important factors in a local setting is the regulatory context which influences the selection of optimal contractual payment model. In European Union (EU) countries, competitive tendering is promoted for public transport service procurement by EU Regulation 1370/2007 (van de Velde, 2008); however, there is not any such regulation in Turkey and public bus services are either directly provided by the local government through a municipal company or concessions are given to the private bus operators. The regulatory framework in EU provides incentives for operators to increase efficiency, reduce subsidies and increase service quality (Mouwen and van Ommeren, 2016). Different contract types prescribe different incentive schemes; therefore, lead to different performance outcomes (Roy and Yvrande-Billon, 2007; Margari et al., 2007). Dalen and Gómez-Lobo (2003) and Piacenza (2006) argue that net-cost and gross-cost payment models are more efficient than cost-plus contracts. In addition, Mouwen and van Ommeren (2016) point out that gross-cost contracts are more efficient compared to net-cost contracts, because the former provides more incentives for cost efficiency and they further highlight that performance-based gross cost contracts is the most efficient in terms of cost efficiency.

Istanbul presents a good case for the problem of selecting an optimal payment model, which will be examined in this study. Having a population of 14.8 million and 11.5 million daily public transport ridership, Istanbul is the most densely populated city of Turkey, and the economic, cultural and historic center of the country. However, rapid urban growth resulted in rapid increase in demand for local public transport. The

problems in service quality have led to increase in car-ownership rates (currently, 180 per thousand people) (Turkish Statistical Institute, 2016). Istanbul has now the 6th worst traffic congestion problem according to global Tomtom Traffic Index (2017). These mobility problems turned the attention of the local authority, Istanbul Metropolitan Municipality (IMM), to increase the service quality in public transport, particularly public bus services in a cost-efficient manner. Bus services are provided by the municipal public bus company, IETT, having 2,141 buses and through concessionary private bus services, OHO and OAS being two private bus operators, having a total of 2,963 buses. However, there are serious service quality problems including crowding, safety, unregulated competition on the road for passengers (Alpkokin et al., 2017). The concessionary or commercial payment model where the operators directly get the ticket revenues and assume cost risk is regarded by IMM as one of the major factors leading to low service quality. Although this payment model incentivizes the operators to increase the number of passengers they carry, given the high and captive passenger demand for bus services, it leads to crowding and comfort problems. This is because private operators try to carry as many passengers as possible per trip, acting only commercially to increase their profitability. The problem is aggravated given the inadequacy of a subsidy mechanism for uncommercial or social services and the lack of a service quality enforcement mechanism. Therefore, IMM tries to change the incentives of private operators by changing the payment model so that service quality is increased in a cost-efficient manner.

In this section, we propose a new payment model for the local authority of Istanbul and private bus operators by using a non-linear mathematical modeling approach. The model tries to find the optimal payment model alternative which optimizes the expectations of i) passengers demanding high service quality, ii) operators demanding high profitability and iii) local government or authority demanding low subsidies. The main contributions of this study include

- Development of a novel mathematical model which gives an optimal payment model among alternatives, and covering the non-linear relations between the stakeholder expectations by using non-linear programming approach,
- Proposal of a better payment model for Istanbul, better satisfying the expectations of passengers, private operators and local government,

- Offering a case study from a developing city context where concession-type service provision is still the norm instead of contracting.

6.2 Literature Review

The implications of different contract models including gross-cost, net-cost and performance-based gross cost models have been examined before (Alexandersson and Pyddoke, 2003; Kennedy, 1995). Pedro and Macário, R. (2016) provides a review of different contracting practices under different institutional settings and give information about the prevalence of different contract types, including gross-cost, net-cost and management contracts. According to this study, gross-cost contracts are more commonly used compared to other contract types. Vigren (2016) carries out a stochastic frontier analysis using the contract data of 21 public transport authorities in Sweden and conclude that incentives do not play a significant role in cost efficiency. Population density and public ownership are the factors that are found to be important determinants of cost efficiency differences.

Putting incentives in the contracts are generally suggested to mitigate the misalignment of different interests by the parties having an agency relation (Hart and Holmstrm, 1986; Grossman and Hart, 1986; Hart and Moore, 1990). Performance –based contracts have recently been gaining importance in public transport as well, both in the literature and in actual implementation by transport authorities around the world. Fearnley et al. (2004) designed a performance-based contract for Norwegian intercity rail transport, which tries to optimize the social objectives of the Ministry of Transport and Communications and commercial objectives of Norwegian State Rail. Another case from Norway concerns the bus industry. Johansen et al. (2001) analyze the case of local public transport in Norway where incentive payments are introduced to net-cost contracts and argue that this form of contract can better optimize the social welfare and the service quality.

"Value for money" approach focuses on providing the best service levels satisfying the customers' needs for each unit of subsidy by the government and performance-based contracts are recommended to maximize value for money (Hensher and Stanley, 2003; Hensher and Houghton, 2004). A performance-based contract tries to maximize the social surplus with optimum subsidy levels, taking into account the commercial

interests of the operators, minimum service levels for the passengers and government's subsidy limits. Hooper (2008) considers the effect of contract theory elements, namely uncertainty and asymmetric information for the contract model choice and underlines the context-specificity of selecting an optimal payment model. Hensher et al. (2016) examine the operators' preferences for contracts using a non-linear multinomial logit model and argue that risk differences of different contract models do not significantly affect the contract choice. Carlquist (2001) discusses the experience of performance-based contracting in Hordaland, Norway and supports it as an instrument for increasing demand through patronage-based incentives.

Hensher et al. (2007) offer a trusting and collaborative partnership model based on negotiation for contracting between transport operators and government for cost efficiency and service quality (effectiveness) reasons. Hensher and Stanley (2008) further this argument theoretically and empirically and propose using incentives and penalties over the life of the contract. Hensher et al. (2013) develop a simplified performance-based payment model where efficient subsidy outcomes are connected with a proxy indicator of net social benefit per dollar of subsidy to obtain gross cost per passenger. The model considers both cost efficiency and service effectiveness. Stanley and van de Velde (2008) discuss the implications of different contract models in terms of risk and reward by bringing a strategical/tactical level approach. They argue that relational contracting based on trust has been gaining interest and conclude that there is no single best contractual solution which can work in every context. Contextual factors such as history, policy preferences and aims of actors play an important role in designing and selecting contractual arrangements.

From a developing city perspective, de Aragão et al. (2009) examine the experience of Manaus, Brazil where risk clauses are added in the contract to transfer some of the risks to the bus operators to change cost-plus contract structure. The paper discusses the legal environment in this shift, which is quite important in developing country settings. Gagnepain and Ivaldi (2002), on the other hand, compare the welfare outcomes of fixed-price and cost-plus contracts in French urban transport and show

that fixed-price contracts call for an informed regulator due to the presence of asymmetric information between operators and regulators.

6.3 General Overview of Istanbul's Public Transport

Istanbul has a relatively integrated public transport system, which includes public buses and a 52-km of bus rapid transit (BRT) line, 156 km of urban rail network (underground metro, light rail, tramway, funiculars, including the Marmaray Bosphorus Rail Tube Crossing), maritime services and paratransit modes such as minibuses, taxis and company and school service buses (Alpkokin et al., 2017). However, the public transport system has problems related with rapid urban growth and changing urban transport demands. Istanbul Metropolitan Municipality (IMM) is the regulator and authority for providing public transport services. Of nearly 11.5 million daily public transport journeys, 3.1 million journeys are done by using bus services, making 27 % of all journeys. Further, the private bus operators carry 2.2 million passengers a day, making 71 % of all bus services.

The mode share of private bus operators has been increasing over the years as privatization of the routes, through giving operating permits to private operators, has been continuing from 1980s onwards. Figure 6.1 shows this trend:

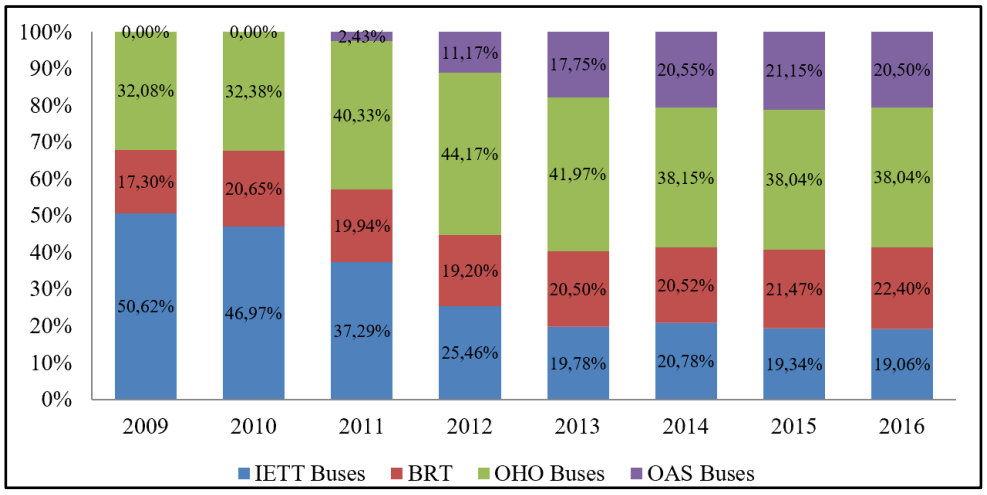


Figure 6.1 : Modal shares (%) of IETT, OHO, OAS Buses and BRT over the years 2009-2016.

OHO means Private Bus Operations in Turkish and OAS means Bus Corporation in Turkish. The mode share of those private buses has increased over the years from 32.08 % to 58.54 %. Privatization of the bus services, however, has led to a decrease in

service quality over the years. Initially, they met the increasing urban transport demand during rapid urban growth. However, as urban growth reached its limits, service quality problems including crowding, safety, passenger "grabbing" on the roads arised. Operating permits, or concessions, are given to these private bus operators, which give them de facto unlimited operating right on the specified routes. They carry revenue and cost risks. This concessionary or commercial payment arrangement causes crowding problems because those operators, acting only commercially, try to carry as many passengers as possible per trip. The lack of a subsidy mechanism to finance the losses of the operators further worsens the problem. On the other hand, there is an implicit subsidy model whereby private operators generally operate mostly on profitable routes, and IETT buses operate on unprofitable social routes. The problem is further aggravated by the fact that those private operators are not companies but rather they are associations of individual bus operators.

6.4 Problem Statement

In order to select an optimal payment model for Istanbul, alternative payment models which are considered by IMM should be introduced. Their different risk characteristics affect the incentives of the operators, thus leading to different performance outcomes. Table 6.1 gives the list of alternative payment models, with risk allocations and model descriptions.

Table 6.1 : Alternative payment models used in public transport (Wallis, 2005).

Payment Models	Cost Risk	Revenue Risk	Model Description
Cost-plus	Authority	Authority	The authority pays the operator a fixed fee; which covers the operational costs and an agreed profit margin.
Gross-cost	Operator	Authority	The authority gets all ticket revenues, whereas payments to the operators are done based on gross cost of the services (on per kilometer or per hour basis).
Net-cost	Operator	Operator	The operator gets the ticket revenues, while the authority pays the operator based on net cost of the services.
Performance -based (PBC)	Operator	Both operator and authority	Incentives are placed to incentivize the operator. The authority gets all ticket revenue.
Commercial	Operator	Operator	Operators get ticket revenues without subsidy from the authority.

The current payment model used in Istanbul for private bus operators can be classified as the commercial payment model. Since it gives the revenue risk to the operators, which cause the service quality problems explained in the previous section. Therefore, IMM considers the payment models where the revenue risk is undertaken by the authority. IMM also does not want to assume cost risk, hence eliminating the cost-plus payment model. The remaining payment models include gross-cost and performance-based contract models.

The gross-cost payment model requires the authority to make payments to the operators on the basis of service provided. This includes per kilometer, per passenger-kilometer or per hour based payments. The current technological infrastructure allows the authority to calculate only the vehicle kilometers that are provided by the operators. Therefore, the gross-cost formula considered by IMM is the following:

*Gross cost payment = Vehicle kilometers provided * Unit payment per kilometer (in local currency)*

On the other hand, in performance-based contracting (PBC) model, the payment is tied to the service quality provided by the operators. Service quality is calculated based on the availability, comfort and time elements, which are the most important service quality factors that IMM tries to increase. IMM considers a gross-cost based PBC model, where the payment is calculated as in the following:

*PBC payment = Vehicle kilometers provided * Unit payment per kilometer (in local currency) + Service Quality * Unit payment for the service quality above the specified standard*

IMM would like to select the payment model where the expectations of the transport actors, passengers, operators and the authority are satisfied most. Therefore, the proposed alternatives include:

- Continuing with current commercial payment model,
- Changing to gross-cost payment model,
- Changing to performance-based gross cost payment model.

6.4.1 Mathematical model

The expectations of each stakeholder, namely private operators, the authority and the passengers were given in Section 6.1. Figure 6.2 shows those expecations and the alternative payment models. In order to consider these expectations together also the constraints, a mathematical programming approach is applied. The nature of the problem needs to consider non-linear relations such as profit margin which can be calculated by dividing profit to revenue (see equation (6.2). Therefore, a non-linear programming models are proposed to find the optimal payment method.

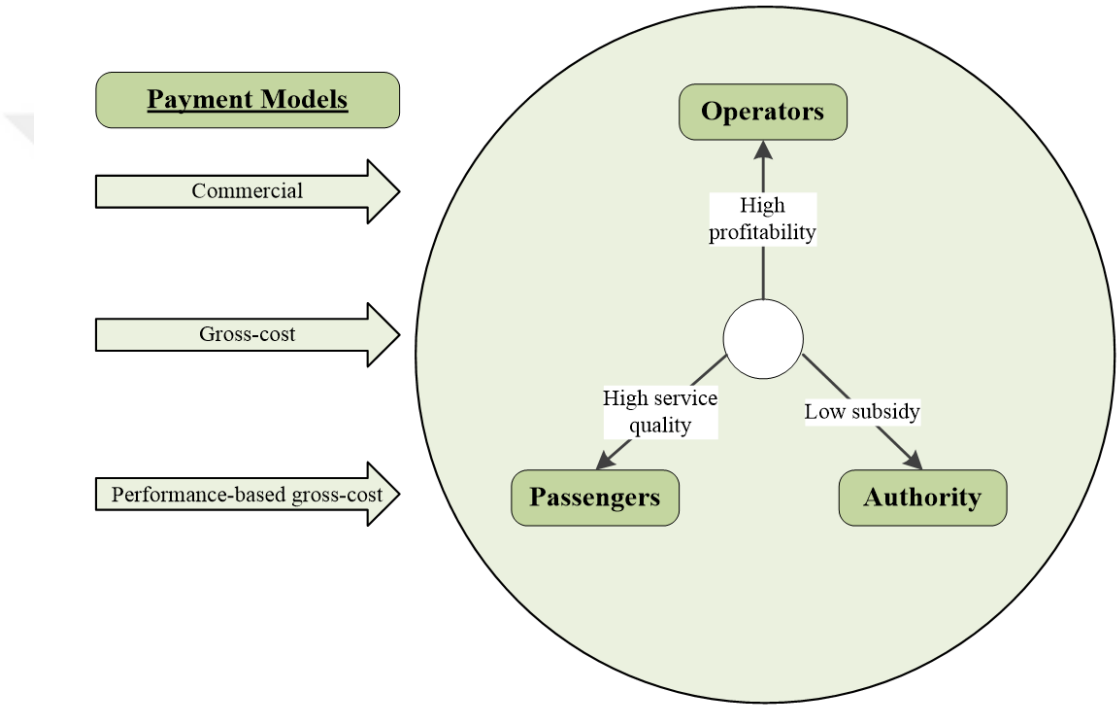


Figure 6.2 : Alternative payment models and stakeholder expectations.

Each payment model is mathematically modeled and the notations for these models are given in Table 6.2.

Table 6.2 : Notation for the mathematical models.

Parameter	Definition
f	The average unit fare.
Q_v	The unit price paid for each kilometer supplied by operators.
Q_h	The unit price paid for unit service quality per vehicle kilometer.
α	The target for the rate of profitability.
β	The target level of service quality.
γ	The target rate of subsidy.
W_1, W_2, W_3	The weights of the comfort, availability (vehicle km) and availability (number of passengers).
T_v, T_p	Target values for vehicle kilometers (T_v) and number of passengers (T_p)
C_v	The unit operating cost per kilometre.
C_0	The opportunity cost for losing a passenger.
l_v, u_v	Lower and upper limits for vehicle kilometres.
u_p	Upper limit for the total number of passengers.
Decision variable	**Definition**
X_p	The number of passengers carried in a year by all the buses.
X_s	The total annual subsidy payment by the authority to the bus operators.
X_c	The total operating cost of all buses.
X_h	The level of service quality.
X_v	The total annual vehicle kilometres done by the buses.
d_1^+, d_1^-	Positive and negative deviation from α, the target rate of profitability.
d_2^+, d_2^-	Positive and negative deviation from β, the target level of service quality.
d_3^+, d_3^-	Positive and negative deviation from γ, the target rate of subsidy.

Assumptions

- All cost parameters (C_0, C_v), unit fares (f) and prices (Q_v, Q_h), are known in advance.
- The authority tries to ensure lower and upper limits for vehicle kilometers (l_v, u_v) and number of passengers (u_p) for sufficient service provision. Putting a lower limit for the number of passengers is not valid as this is determined by the number of passengers in the market.
- All stakeholders (operators, passengers and authority) expect achieving the objectives (α, β, γ) set by the authority.
- The route lengths are fixed during the year.
- The weight factors (W_1, W_2, W_3) for comfort, availability (vehicle km) and availability (number of passengers) are calculated based on the results of customer satisfaction survey carried out in 2014 (IETT, 2014).
- The number of available vehicles for service does not change in a year.

6.4.1.1 Commercial payment model

Objective Function

The objective of the model is to maximize the satisfaction of the stakeholders' expectations. To achieve this aim, the objective function is formulated by the sum of the deviations from the targets, as indicated in equation (6.1):

$$\min Z = d_1^- + d_2^- + d_3^+ \tag{6.1}$$

Negative deviations (d_1^-, d_2^-) are included in equation (6.1) to indicate the penalties of the targets which are tried to be maximized. Conversely, the only positive deviation (d_3^+) indicates rewarding the targets aimed to be minimized.

Constraints

First, private operators try to maximize the rate of profitability over a pre-specified threshold as shown in equation (6.2). Second, passengers demand the highest service quality as much as possible, as shown in equation (6.3). Third, the transport authority tries to minimize the subsidies given to the bus operators, as indicated in equation (6.4):

$$\frac{X_p * f + X_s - X_c}{\left(X_p * f + X_s\right)} - d_1^+ + d_1^- = \alpha \tag{6.2}$$

$$X_h - d_2^+ + d_2^- = \beta \tag{6.3}$$

$$\frac{X_s}{\left(X_p * f\right)} - d_3^+ + d_3^- = \gamma \tag{6.4}$$

The service quality elements included in this model are "*comfort and availability*" due to their variability according to the alternative payment models (see equation (6.5)). The availability includes both vehicle kilometers realized with respect to the target value and the number of passengers carried with respect to the target value. The number of passengers carried is regarded as a service quality element due to its central role in Istanbul's case. Also, the increase in those service quality elements are the main objectives of the authority for the passengers for the purposes of this study.

$$X_h = W_1 * \frac{X_v}{X_p} + W_2 * \frac{X_v}{T_v} + W_3 * \frac{X_p}{T_p} \tag{6.5}$$

The comfort level is calculated by the inverse of passenger per vehicle kilometer and multiplied by the weight factor, W_1. The availability for vehicle kilometers is calculated by dividing the total realized vehicle km. with targeted vehicle km and multiplied by the weight factor, W_2. This shows the extent to which planned vehicle km. is realized over the operating period so that the service is available for the passengers. The availability for the number of passengers is calculated by dividing the total number of passengers carried over the operating period with targeted number of passengers and multiplied by the weight factor, W_3. These weights are taken from the results of the IETT 2014 Customer Satisfaction Survey results where each respondent is asked about the importance of the specific quality criteria based on a likert scale from 1 to 10.

The total operating cost is composed of two components (see equation (6.6)). The first one is the unit cost incurred by the private operators per kilometre. The second component is the opportunity cost of losing a passenger. If targeted number of passengers cannot be reached, in this case, there is a loss of potential revenue and multiplied by the unit opportunity cost, C_0. On the other hand, if the targeted value is exceeded, then this is regarded as a positive return and again multiplied by C_0.

$$X_c = X_v * C_v + (T_p - X_p) * C_0 \tag{6.6}$$

The total amount of subsidy is calculated by subtracting the total passenger revenue from the total operating cost and added by the minimum profit rate which is calculated as a percentage of total operating cost, as shown in equation (6.7).

$$X_s = \max(X_c - X_p * f + X_c * \alpha; 0) \tag{6.7}$$

The service quality level must be lower than *1*, as shown in equation (6.8).

$$X_h \leq 1 \tag{6.8}$$

The transport authority defines a comfortable service level based on the passengers per kilometer and it must be ensured by the lower and upper limits, given by the authority (see equation (6.9)). The authority sets this target as an operating rule based on the past values.

$$1.5 * X_v \leq X_p \leq 2 * X_v \tag{6.9}$$

The authority also defines lower and upper limits for vehicle kilometres realized annually, which must be ensured by equation (6.10). Those values are specified for each year by the authority.

$$l_v \leq X_v \leq u_v \tag{6.10}$$

The authority also defines an upper value for the number of passengers that can be carried by all the buses, based on the number, capacity and schedule of the vehicles, as indicated in equation (6.11). For this study, the fleet profile is given.

$$X_p \leq u_p \tag{11}$$

Lastly, equation (6.12) provides the valid ranges for decision variables.

$$d_1^+, d_2^+, d_3^+, d_1^-, d_2^-, d_3^- \geq 0 \tag{6.12}$$

$$X_p, X_v, X_c, X_s \geq 0$$

6.4.1.2 Gross-Cost payment model

Objective Function

In gross cost payment model, the objective function is the same as commercial payment model equation (6.1).

Constraints

The expectation constraint of the operators changes because of changing revenue function and given in equation (6.13):

$$\frac{X_v * Q_v + X_s - X_c}{X_v * Q_v + X_s} - d_1^+ + d_1^- = \alpha \tag{6.13}$$

The formula for the subsidies paid by the authority to the operators changes as shown in equation (6.14):

$$X_s = \max(X_c - X_v * Q_v + X_c * \alpha; 0) \tag{6.14}$$

The rest of the constraints are the same as the equations (6.3 – 6.6) and equations (6.8 – 6.12) of the commercial payment model.

6.4.1.3 Performance-Based gross-cost payment model

Objective Function

In performance-based gross cost payment model, the objective function is defined as the same as that of commercial payment model equation (6.1).

Constraints

The expectation constraint of the operators changes because of changing revenue function and given in equation (6.15). The performance payment is calculated by paying for the unit service quality level per vehicle kilometer:

$$\frac{X_v * (Q_v + Q_h * X_h) - X_c}{X_v * (Q_v + Q_h * X_h)} - d_1^+ + d_1^- = \alpha \tag{6.15}$$

The expectation constraint of the authority also changes due to changing subsidy formula as given in equation (6.16):

$$\frac{X_v * (Q_h * X_h)}{(X_p * f)} - d_3^+ + d_3^- = \gamma \tag{6.16}$$

The rest of the constraints are the same as the equation (6.3), equations (6.5– 6.6) and equations (6.8 – 6.12) of the commercial payment model.

6.5 Numerical Experiment Results

6.5.1 Case results and findings

The problem is to select a payment model which optimizes the satisfaction of the expectations. The authority gives targets, unit prices and costs as in Table 6.3:

Table 6.3 : Parameter values and units.

Parameters	Value	Unit
f	1.75	₺ (local currency)
Q_v	5.25	₺ (local currency)
Q_h	1.00	₺ (local currency)
α	10	%
β	50	%
γ	30	%
T_v, T_p	375, 1000	million km, million passengers
C_v	5.27	₺ (local currency)
C_0	1.75	₺ (local currency)
l_v, u_v	200, 500	million km
W_1	43.5	%
W_2	34	%
W_3	22.5	%

Three constructed mathematical models for alternative payment models are performed and solved in GAMS Optimization Software with a computer having 3.6 GHz CPU and 16 GB RAM.

Table 6.4 : Objective function values.

	Commercial Payment	**Gross Cost**	**Performance-Based Gross Cost**
Objective Function	0.454	0.089	1.312
d_1^+	0	0	0
d_1^-	0.009	0.009	1.142
d_2^+	0.420	0.335	0
d_2^-	0	0	0.170
d_3^+	0.445	0.08	0
d_3^-	0	0	0.3
X_p	9.2535 E8	8.3468 E8	3 E8
X_s	1.2065 E9	5.5535 E8	-
X_c	2.5689 E9	2.5736 E9	2.279 E9
X_h	0.920	0.835	0.330
X_v	4.6268 E8	4.3346 E8	2 E8

The results show that gross cost payment model better satisfies the expectations of the stakeholders given the parameter values in Table 6.3. Although the targets for the number of passengers (T_p) and the total annual vehicle kilometers (T_v) are best met by the commercial payment model, this brings a much higher subsidy rate compared to gross cost payment model. In case of low number of passengers need to be carried by the operators and vehicle kilometers supplied, the performance-based gross cost model can be a suitable option. Howewer, the high passenger numbers in Istanbul as well as the corresponding high vehicle kilometers needed to be supplied to carry those passengers brings a heavy financial performance payment burden for the authority. As a result, gross cost payment model can be selected by the transport authority given the expectations of stakeholders under Istanbul's conditions.

6.5.2 Scenario analysis

In this section, the effects of different levels of the parameters used in the models on the different performance criteria such as annual vehicle kilometers, number of passengers, profit rate, service quality and subsidy rate are investigated. Some of the parameters such as target profit rate and target service quality may have interaction on the number of passengers. For example, the rise in target profit rate aims to increase the number of passengers carried while target service quality can cause a contrary

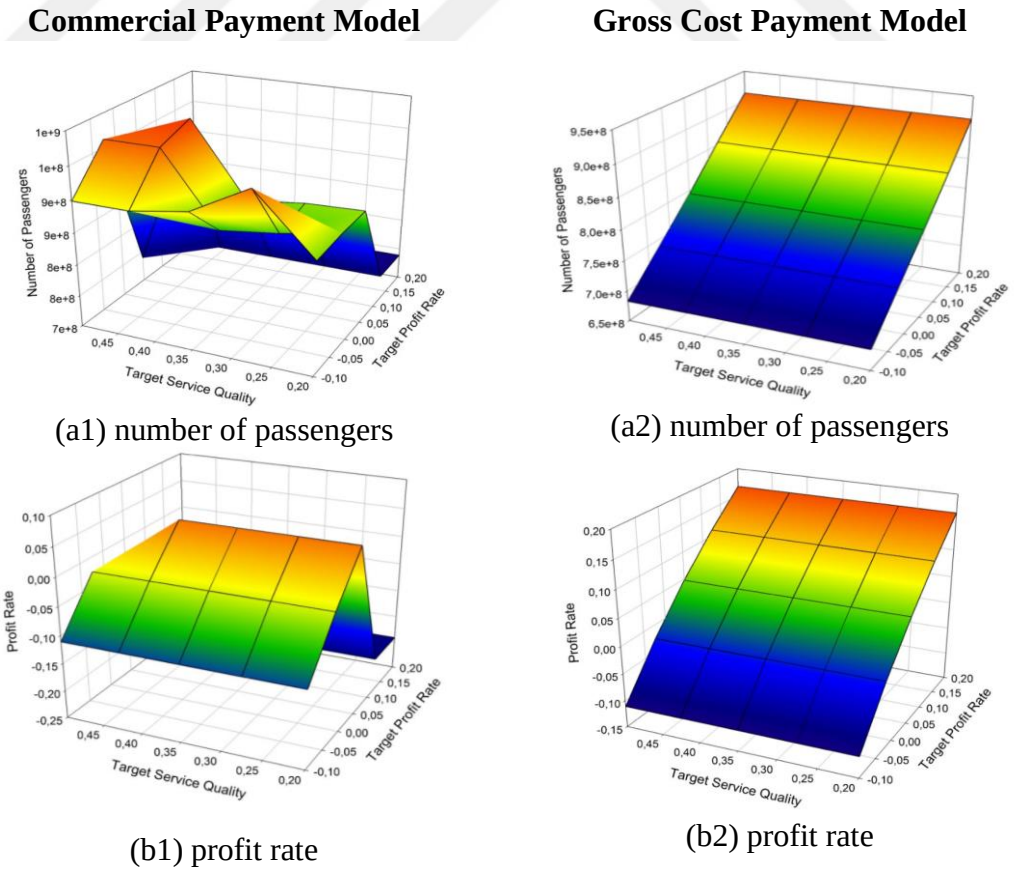
effect. Therefore, these interrelationships are inverstigated in three-dimensional graphs.

Firstly, the effect of target service quality and target profit rate on the number of passengers is illustrated in Figure 4 (a1 and a2). In commercial payment model, the target profit rate, target service quality and their interactions have an influence on the number of passengers. The rise in target profit rate brings about a decrease in the number of passengers, after an initial short-term increase. Similar results are valid for the number of kilometers as the number of passengers carried is related with the number of kilometers (see equation (6.9)). The high target profit rate necessitates, according to the commercial payment model, lower kilometers, because additional kilometers add on the operational costs of the operators. Therefore, there is a tradeoff between the additional kilometers and their cost implications and additional passengers and their revenue contributions. The rise in cost dominates the rise in revenues, thus decreasing the kilometers and number of passengers, which explains the behavior of the graph. On the other hand, in gross cost payment model, the target profit rate is strongly related with the number of passengers, whereas the target service quality is slightly related with the number of passengers. The rise in target profit rate triggers the increase in the number of passengers. As the revenues of the operators depend on the kilometers supplied, this brings about an increase in kilometers as well as the number of passengers. However, the effect of service quality is very limited. As the number of passengers depend on the annual total vehicle kilometers, the results are similar for kilometers as well. The service quality is calculated according to the number of passengers, thus giving the similar results for it.

The second set of graphs (b1 and b2) in Figure 6.4 shows the interaction of target service quality and target profit rate together with the profit rate. In commercial payment model, target profit rate influences the optimal profit rate, depending on the level of target service quality. On the other hand, in gross cost payment model, the effect is negligible. This finding is consistent with the real-life situation faced by Istanbul, as the increasing service quality targets affect the profit rate of private operators, hence creating a conflict between the authority and operators. Third graph about the subsidy rate (c1) in Figure 6.4 for commercial payment model shows that subsidy rate is inversely related with the number of passengers when compared with

Figure 6.4. (a1). The reason is simply that when the number of passengers decrease, the operators' revenues decrease, hence the need for more subsidy. However, in gross cost payment model, passenger revenues do not affect the operator revenues, hence no direct relationship with the subsidy rate. The effect of target profit rate on total vehicle kilometers is also moderated by the target subsidy rate (Figure 6.4. (d1)).

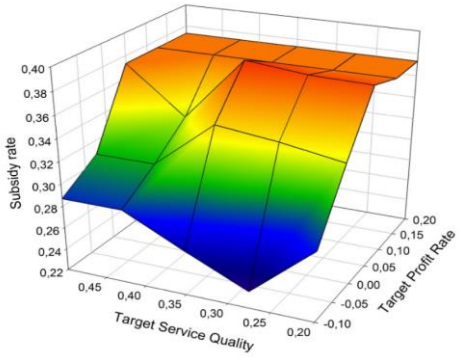
Similar analyses are performed for the performance based gross cost model; however, the optimal solution is not affected by the changing levels of target values. It can be deduced that the performance based gross cost model is the most robust model according to different parameter values. This is why graphs related with this payment model are not included in Figure 6.3. In the performance-based gross cost model, the model tries to give miminum values for the number of passengers and vehicle kilometers. The reason for this is the high amount of performance payments for each additional passenger due to penalizing the deficiency from the target passenger numbers. Hence, this model seems not in line with the expectation of the transport authority which is low subsidy and performance payments.



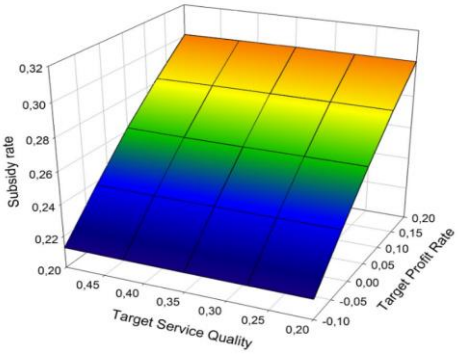
(a1) number of passengers (a2) number of passengers

(b1) profit rate (b2) profit rate

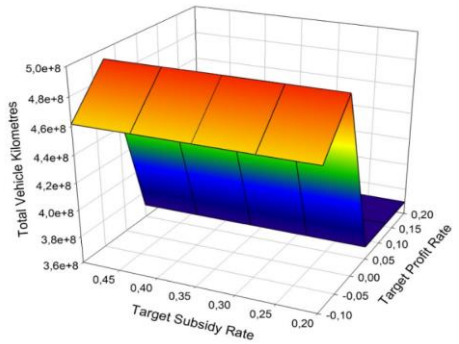
Figure 6.3 : Comparison of the payment methods under different conditions.



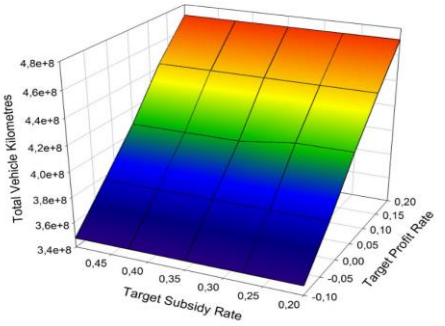
(c1) target service quality



(c2) target service quality



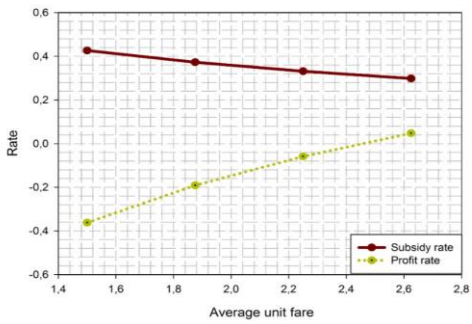
(d1) total vehicle kilometers



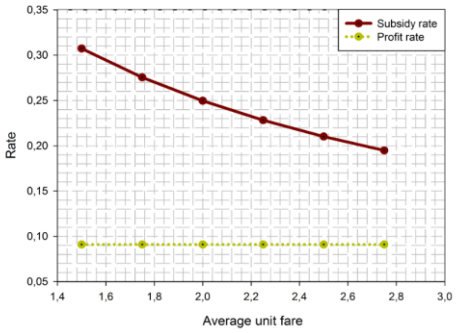
(d2) total vehicle kilometers

Figure 6.3 (continued) : Comparison of the payment methods under different conditions.

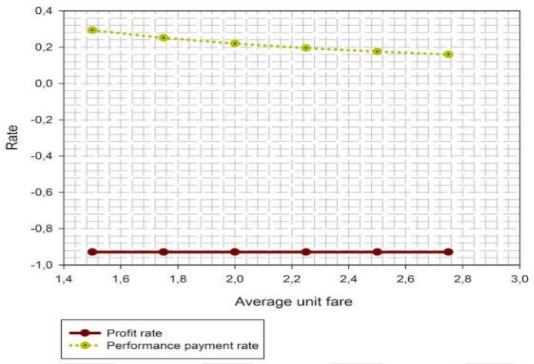
For the average unit fare, the possible range values between *1.5* TL and *2.75* TL are given by the transport authority. An increase in average unit fare in the commercial payment model increases the profit rate as it directly affects the passenger revenues of the operators without changing the optimal solution, as illustrated in Figure 6.4. (a). Besides, the increase in average unit fare brings about a decrease in subsidy rate, due to increased profits of the operators, hence less need for government subsidies. On the other hand, the change in average unit fare in gross cost payment model does not affect the profit rate, because operator revenues do not depend on ticket revenues in gross cost payment model, as shown in Figure 6.4. (b). In performance based gross cost model, profit rate does not change with changing average unit fares, the reason being the same as gross cost model. Also, in place of subsidy payments, performance payments are paid to the operators, and they slightly decrease with increasing average unit fares. The reason for is that performance payments are inversely related with passenger revenues.



(a) commercial payment model



(b) gross cost payment model



(c) performance based gross cost model

Figure 6.4 : Comparison of the payment methods under different average unit fares.

6.6 Policy Implications

This section proposes a non-linear mathematical model to solve the problem of selecting best payment model which optimally satisfies the stakeholders' demands and expectations. Although the proposed mathematical model is developed and solved to address Istanbul's public bus transport setting, the implications have the power to guide optimal payment model selection for other cities. Bringing a stakeholder approach to this problem, the developed method is distinguished from the previous methods where either cost efficiency or network effectiveness concerns override the other one. In the proposed model, the expectations of all stakeholders including private bus operators, transport authority and passengers as separate entities are directly taken into account. By this way, the utility differences and potential conflicts of interests of relevant stakeholders are acknowledged as they are without embedding one actor's interests into another one. A feasible and optimal solution is searched through the proposed non-linear mathematical method.

Although there might be overlapping expectations among the actors, considering those expectations as separate utility functions is argued to be a better way of finding a consensus among the actors. For example, high service quality offered to the passengers is aimed not just by the passengers but also by the transport authority; however, it is the passengers rather than the transport authority as a formal institution which suffers most from the low service quality. Similarly, although private bus operators may demand a high service quality for the passengers, when this demand is in conflict with the desire to have higher profitability rates, the service quality can be forsaken to achieve greater profitability. This is especially the case in developing city settings where regulatory environment is not effective to ensure a high service quality at all costs due to capacity or enforcement inadequacy. The low service quality and its consequences suffered by the passengers may not lead to a change in the administration of the transport authority, which is a political problem rather than a technical one. The transport authority as a public institution may also have other objectives besides the provision of a high quality urban transport service for the citizens such as ensuring a balanced budget. In this case, the authority has an objective to minimize the subsidies or other forms of incentive payments.

Our model recognizes all those expectations as valid and tries to find a solution under the given regulatory and institutional environment. One can suggest a regulatory and institutional change in the organization of public transport like changing from a concession model to a competitive tendering scheme; however, this requires a much broader political and strategic change in the management of public transport sector which requires a long-term perspective. Our model acknowledges those regulatory constraints as given and tries to find a middle ground between the stakeholders without prioritizing the demand of an actor over the other. The proposed methodology can also be extended to fuzzy or stochastic programming approach which help us to consider the uncertainities. All in all, the proposed non-linear mathematical model presents a novel approach especially for developing cities where achieving more optimal ways of regulatory arrangements is limited. Public transport authorities and designers in those settings are believed to find the proposed approach and methodology quite useful. It shows that a way for improvement is possible and achievable under the current regulatory framework.

7. CONCLUSIONS AND RECOMMENDATIONS

The complexity of the issues related with UPT requires an interdisciplinary perspective encompassing various fields such as economics, organization theory, urban planning, engineering, political science, law and management, which is just what NIE is intended to provide. Although different theories and approaches from NIE literature such as agency theory and transaction cost economics have already been used in many UPT studies, *a systematic and concise* analysis and review of NIE literature with regard to its implications on UPT have not been attempted before. This thesis tried to fill that gap. In this respect, this thesis does not just provide an overview of the relevant literature, but it also provides a critical review of UPT from a NIE perspective. Inspired by the exciting development of NIE in other research fields, the ground for future NIE-oriented transport studies is prepared. NIE perspective is a useful conceptual framework for both practitioners as well as researchers. Although in this thesis, researchers in NIE and UPT fields are targeted first, the ideas and insights offered throughout the thesis can be utilized by practitioners focusing on the institutional reform, policy transfer or systematic improvement initiatives.

Agency costs are often ignored in cost efficiency evaluations of urban public transport because these costs are less visible compared to operating and capital costs. Due to the conflict of interests between the public service orientation of the transport authority and the profit motive of the private operators, NC contracts might bring about agency costs in the form of reduced service quality for passengers and additional monitoring costs for the transport authority. Istanbul's case for the bus and minibus operators presents four different agency costs because of the NC contract model in place. These are decreasing safety and comfort levels because of overcrowding; reduced affordability caused by the influence on fare-setting by those operators; increasing monitoring costs to organise route assignments; and decreasing reliability due to the breach of schedule. To reduce these agency costs by aligning the interests of the private

operators and the transport authority, a PrGC contract model is suggested. Agency costs can be different in different urban public transport settings.

What characterises the particular case of Istanbul are the already high, and captive, demand and an inadequate regulatory and financing mechanism. These are often the case for rapidly growing and developing urban transport systems so the findings from Istanbul have wider applicability. Furthermore, the informal and semi-formal transport modes in Istanbul are common particularly in developing countries and cities. Therefore, this thesis, based on an agency theory perspective, provides a deeper understanding of the problems created by these various transport modes. Those developing megacities suffering from a lack of adequate regulatory and institutional structures can also draw on the findings presented in this paper. However, contextual factors such as the level of trust between the operators and authorities, the level of integration among the transport modes or the technical capacity of regulators should be considered before transferring the results. The findings are not directly applicable for the developed city settings where established regulatory arrangements may mitigate the emerging agency costs.

It is not technology, or any organisational or governance practice *per se*, that can holistically improve the performance of the urban mobility system, but it is the ability to embed technology and organisational and governance practices into current institutional frameworks that can improve performance. One of the claims this thesis makes is that only through reform of the institutional governance practices is it possible to bring about systematic improvement in the delivery of better urban public transport.

Istanbul's current urban mobility experience with private bus and minibus operators has been examined in this thesis to highlight the above claim. With its variety of urban transport modes and its more than 140 years of public transport history and culture, Istanbul offers unique and complex urban mobility problems for researchers to address. Having a relatively integrated public transport system, but one that is in need of a structural and institutional reform to increase its performance, Istanbul's urban mobility experience has been scrutinised in this paper and solutions and policy recommendations have been formulated. One of the main limitations of the study is the limited data available for these semi-formal (in the case of private bus operators)

and informal (in the case of minibus operators) public transport systems. Admittingly, it would have been more convincing had more quantitative data to support the proposed propositions been used. IETT, as a formal operator, is the best operator in terms of data collection. As for minibus operators, apart from the number of vehicles, there is not any data available. Even the number of passengers is not measured and collected. In addition to surveys, interviews are conducted and workshops are organised by IETT to gather more information to overcome this difficulty. Regarding private bus operators, IETT has recently started initiatives to collect data and improved data collection in the future can further extend the discussion on the topic of contracting models.

By employing an institutional perspective based on the agency theory approach, we have demonstrated the effect of the conflict of interests on urban mobility performance in Istanbul. This thesis suggests how the agency theory approach may usefully complement the already existing methodologies used in the urban mobility literature to analyse urban mobility performance. How an agency analysis may contribute to a deeper characterisation of the urban mobility systems is also revealed. Integrating urban mobility and agency theory offers a promising and fruitful avenue for the field of urban mobility and public transport literature. Analysing the agency relations of passengers with local authorities, public bus drivers with passengers or bus owners with drivers offers interesting topics for subsequent agency theory inspired research. The literature on urban mobility system performance can be enriched by continuing research on how actors in those systems actually interact and how these interactions affect the overall system performance.

All-encompassing contractual solutions which do not take into account the broader institutional environment (culture, norms, policy preferences, property rights etc.) may not work as intended, calling for more hybrid solutions, particularly in weak or developing institutional settings. For this purpose, the case of Istanbul's urban public bus transport is presented and an interpretive approach to better capture the institutional elements and interactions between them within their context, strategic actions of public transport actors as well as evolutionary history of the institutional arrangements in a holistic and interdependent way are implemented. Although the case is provided in bus sector to ground the proposed theoretical considerations, the lessons

may also be valid in rail sector, opening the way for empirical cases in rail sector as well.

This thesis seeks to provide both theoretical and empirical answers to the research questions raised in the introduction section. It is argued that one of the most important key factors for the choice of optimal procurement model, be it competitive tendering or negotiated contracts, is the level of institutional maturity, in its formal and informal dimensions. The mechanism of this influence is moderated by the transactional features, namely asset-specificity, uncertainty and frequency as well as resulting transaction costs. Compared to negotiated contracting, competitive tendering can be more effective in weak institutional environments provided that transaction costs are low. In case of higher transactions costs in those settings, in-house operations seem to be more effective in terms of service quality as Istanbul's case illustrates. The institutional elements, both formal and informal, influencing the selection of efficient procurement types, which are addressed in this thesis, include appropriate intervention mechanisms in case of market failure, levels of trust and social capital among the economic actors, shared norms and customs, efficient partnership and cooperation culture, rules of competition, well defined property rights and common political vision. Lack of a competent transport authority and a well-defined legislation guiding policies and strategies in weak institutional settings directly influence the institutional maturity and transaction costs, hence the optimal procurement type.

This thesis is believed to present crucial transferable results especially for weak institutional settings. Robustness of results, however, depends on the correct identification of institutional context. The thesis is not far from the problem of accurately operationalizing the notions that we propounded in the theory section. It has to be acceded that neither a full-fledged mathematical formulation of institutional maturity nor the exact formula for its effect on transaction costs is possible. However, this should not discourage us from developing theoretical insights which can be substantiated by further case studies. Ideas and concepts from new institutional economics literature offer many novel avenues for future research in public transport field. On the other hand, one of the major research limitations we faced in this thesis is the lack of reliable quantitative data to support the theoretical arguments, which is especially the case in weak institutional settings. Instead of using user satisfaction

scores to evaluate the performance of different models, other performance indicators regarding network effectiveness and service quality would be preferred. However, the bus operators as well as IMM, the transport authority, are not collecting regular and standard data. Therefore; interviews, surveys, company statistics and financial reports, which are prepared mainly for compulsory legislative reasons rather than service quality reasons are used.

As it is the situation in the Istanbul case, existence of three different contract schemes simultaneously in the same organizational environment may seem contradictory with transaction theory, which suggests that the contractual structures that do not adopt the most efficient design underperform and are selected out of existence. In the absence of a perfect competition, as it is generally the case in public transport, optimal exchange efficiency is not always the result. Particularly, when efficiency-based competition is weak or non-existent, efficiency plays a much smaller role in design adoption. Accordingly, an analysis of the determinants of design adoptions in such institutional settings in public transport is also worth a thorough investigation. In this perspective, besides transaction cost economics theory; agency theory, property rights theory, contract theory and path dependence promise new frontiers of research in public transport studies.

The basic takeaway from NIE is to consider the elements of UPT as embedded within the broader institutional environment. Rules of the game shape the actions of actors and actors, in turn, shape the rules of the game in a mutually reinforcing way. This institutional perspective helps contextualize the problem areas in UPT so that they can be better addressed. Empirical evidence, on the other hand, to support the argument that NIE-based approaches indeed improve the service delivery outcomes can be the subject of further studies. In this thesis, we limited ourselves to showing the theoretical and conceptual links of NIE with how it can add value to the management and organization of the UPT systems. The implications of behavioral economics-based approaches on transport planners' or policymakers' decision-making processes with respect to the institutional issues can also be studied in future studies.

A robust institutional configuration of an urban transport system also enables the proposed sustainable urban mobility policies to be better materialised. A fragmented institutional setting, as in the case of Istanbul, prevents the application of a coherent

transport policy. Therefore, the thesis provides a useful framework for the policymakers to set out an integrated institutonal setting to allow a more effective implementation of the transport policies. This is particularly important for cities seeking to adopt sustainabile urban mobility policies but fail to materialize these policies. This thesis does not aim to specifically propose which transport policies to be adopted, but rather aims to answer the question which institutional setting is better to achieve the policies to be adopted. Nevertheless, the thesis proposes the adoption of sustainable urban mobility policies which would bring about a socially inclusive and just, economically affordable and environmentally less polluting urban mobility. The thesis also defends a more regulated and public service oriented urban mobility model instead of a market-based and deregulated model. The author of this thesis believes that a sustaianble urban mobility model with the right institutional structures to support it is key to sustainable, livable and inclusive cities. The design of an institutonal setting to facilitate the implementation of sustainable urban mobility policies is crucially needed, and this thesis is believed to contribute to this aim.

All in all, NIE can indeed provide powerful tools, novel conceptions and helpful insights in the analysis of UPT issues. Taking stock of the current literature, we tried to open up new avenues for future research in this area and further studies with a NIE approach in other transport fields besides UPT promise new research territories. Therefore, future interest or disinterest in the subject of NIE in transport fields can validate or invalidate our endeavor for this thesis.

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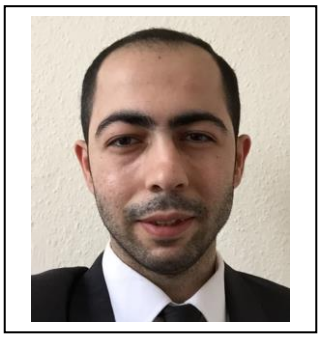

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