MOTIVATIONS FOR INNOVATION IN PUBLIC TRANSPORT: THE BENEFITS OF A LOW COST PERSPECTIVE

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1. Introduction

Urban public transport is an old industry; the first system, a horse-drawn bus, was organized in 1662 in Paris by Blaise Pascal and closed down shortly after, probably in 1667 [Costa and Fernandes, 2012]. Although there have been some major changes since this early start (notably due to the vehicle change, traction systems optimization and to the adoption of new modes, fare collection systems and organizations), public transport can hardly be classified as one of the most innovative industries. Thus, transport operators do not figure in strategic consulting firms' rankings as the top 100 global innovators 2012 of Thomson Reuters, or in the 50 most innovative companies 2012 by the Boston Consulting Group.

Nevertheless, innovation seems to be present in urban public transport. There are currently three main paths for innovation motivation that can be clearly identified in the literature on urban public transport, as well as in the calls for projects by financing organizations such as the World Bank: innovation motivated by the environmental and sustainability questions, such as climate change and resources depletion; innovation motivated by policy making; and innovation fueled by technology changes (mainly Information and Communication Technologies (ICT)) and their applications.

Due to the raise in worldwide public transport demand, linked to increased urbanization and growing demands of environmentally friendlier and less expensive transport than private cars, as well as limited funding (e.g. Pucher et al., 2005), a low cost approach of transport systems can be observed in some countries. A clear example of this approach can be found in some recent light rail projects in France, also called tramways. A growing focus on reducing the project costs can be found, today mainly achieved by the use of standardization (like for example in the case of the Besançon tramway, that uses standard material from a Spanish producer called CAF, the only personalized feature being the color of the trains, with estimated savings of 9.5 million euros when compared to personalized material as used in other networks) or by economies of scale achieved through grouped purchases (the French cities of Brest and Dijon estimated the grouped purchase of their trains allowed them to save 20 million euros). Decision makers and financers, often represented by national transit authorities, are the main actors asking for these changes. Another example of the same trend can be observed in the 2008-2012 World Bank transport business strategy, that includes 'affordability' as one of the main goals [The World Bank, 2008].

In this context of contemporary evolutions of public transportation systems led by specific motivations for innovation, this article aims to contribute to public transportation management, more specifically to the benefit of low cost approach as innovation driver in the sector. First, it aims to identify the main urban public transport innovation motivations developed in scientific literature. Second, it shows how researchers have integrated the recent trend of developing low cost public transport in their works. It

furthermore tries to evaluate if the applications in the field are coherent with literature, by analyzing the research and innovation program of a French public transport operator around low cost. We conclude that achieving low cost is a motivation for innovation, and should not be treated separately as only a productivity tool. And even more than a mere motivation for innovation, low cost can also be a catalyzer to innovate in other motivational fields for public transport operators, where they would otherwise have trouble justifying their investments.

This article starts by giving the main motivations for this study through a state of the art in innovation and low cost (section 2). In section 3, we describe the method used to locate and select the relevant literature and, we present a field application in a French public transport operator. Next, we will present the results of the systematic literature analysis and the field application (section 5). Section 6 discusses these results and we will finish with the main conclusions and implications for managers, researchers and policy makers.

2. Innovation and low cost, two under-linked concepts: a state of the art and how these relate to public transport

Innovation is acknowledged today as one of the key sources of competitive advantage [OECD, 1997]. This leads several companies to invest in innovation, but with very different returns on investment. One of the reasons for this is that although the importance of innovating has been established, the "how to do it" seems to be less discussed in literature.

In public transport, innovation has been discussed with different meanings attached. In some cases, innovation is still a synonym for technical innovation [Delle Site et al., 2011], whereas [Hyrad, 2013] classifies innovations into two different areas: technical and non-technical innovations. In a similar logic of innovation meaning enrichment, [Ongkittikul and Geerlings, 2006] classified innovation into three areas, namely: technical innovation, competence development and service innovation.

Innovation and innovativeness are not yet stable concepts and are difficult to evaluate, several authors having their own criteria [Garcia and Calantone, 2002]. Cost reduction is often one of them and is discussed in the strategy literature by [Porter, 1996] as achievable by two different paths. The first path consists on achieving cost reductions through operational effectiveness: the same client utility is still delivered, but at a lower cost. This can be achieved through a process innovation, but the final product or service is supposed to remain unchanged. This path is considered essential for company's survival, but not as a strategy, and therefore not a way to achieve competitive advantage. The second path is the cost leadership positioning: a change is operated in the client utility, as in the case of low cost airlines. Cost leadership is linked to a standard or no-frills product, and therefore not often linked to innovation. Innovation has in this view rather been associated to the differentiation strategy, by opposition to the cost leadership strategy, and the development of products with price premium.

Despite this first contradictory positioning of low cost and innovation, other ways to achieve cost reductions and low cost have been discussed in literature. Thus [Christensen, 1997] sees low cost as a possible component of disruptive innovations. Disruptive innovations start off with a worse performance in some criteria, but a better performance in other criteria (for example unitary cost), and since incremental innovation and the search for more 'premium' markets tend to create products that overshoot the client's need, they are attractive for a part of the market.

Another way of combining the two concepts is seen in frugal innovations: these are defined as cheap, tough, easy to use and developed with minimal amounts of raw materials [Rao, 2013]. That is also the case of 'jugaad innovation', a concept developed in India that aims to 'do more with less', by integrating constraints existing in the developing countries as opportunities to innovate [Radjou et al., 2012].

Another point that seems unclear is if the innovations should be looked at from a macro- or a microlevel. Should only new to the world, market or industry innovations be considered as such, or should innovations that are new for a firm or a customer be considered too?

Public transport is often put forward as the low cost alternative to private car ownership and its negative externalities [Badami and Haider, 2007]. However increasing pressure on transport budgets has been the main motivator to look into cost reductions in this sector too. Since public transport has a strong path dependency and is planed on the long term, two different types of reductions can be found.

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Cost reductions in investments of the construction of new systems, which is one of competitive tendering's goals; and cost reductions in operations, for example through organizational restructuring and cutting underutilized routes and services. Both of these approaches are strongly linked to operational effectiveness logics.

3. Methodology: Facing a systematic literature review to a field application

Two different methods were used jointly in this research. First, a systematic literature review was used as the method is known for its relevancy *"to identify key scientific contributions to a field or question and its results are often descriptively presented and discussed."* [Becheikh et al, 2006, p645] According to [Tranfield et al. 2003], traditional 'narrative' literature reviews are frequently biased by the authors and do not capture the collective meaning of research done in a field. This can be a source of problems when inadequate or incomplete studies are used as a basis for decision-making. Systematic review allows to reduce the bias and to provide more reliable results for taking decisions. Afterwards, we conducted an action research [Coughlan and Coghlan, 2002] in a public transport operator, which launched a research program in developing low cost solutions for public transport. Finally, we compare the first results from this program to the scientific literature analysis.

3.1. Building a systematic literature review

To identify the main innovation motivations in public transport in the last years, a systematic literature review was conducted. It was based on the search-terms "public transport" AND "innovation", in three databases — "ScienceDirect", "Web of knowledge" and "Transport Research Board", from 2006 to mid-2013. These three databases were chosen as they allowed to systematically cover the main public transport journals. Only scientific articles were taken into account, to facilitate comparison.

The year 2006 was chosen as the first year of study because of the article by [Ongkittikul and Geerlings, 2006], where authors stated that *"there is a lack of interest in the issue of innovation in the public transport sector"*[ibid, p283], although according to the authors the term innovation has come into popular use in some public sector areas, including the transport sector. This article gives a review of areas in which innovation exists in public transport and *"attempts to explain how the innovation in public transport takes place and what the important factors are"* [ibid, 2006, p291]. The goal of choosing this starting point was to see how the interest in innovation in transport evolved from a moment where it was stated that it was very low.

To be part of our database, the articles should treat an innovation in public transport. Innovativeness was assessed based on the authors' self-evaluation. Articles that included the word 'innovation(s)' or 'innovativeness' in their title, keywords and abstract were included. Furthermore, articles that contained 'technological change', 'technical change' and 'organizational change' in their title, keywords and abstract were also included.

The rejection criteria used for our systematic review were:
1. Since the goal of this study is to evaluate the main areas in which urban public transport has seen significant innovations, the papers that were mainly about air transport and long distance trains were eliminated.
2. The papers that were only about a new technology, for example fuel cells, but did not cite a possible use of this technology for public transport were also eliminated.
3. The papers that were only about private transport modes, like cars or bikes owned by the user and used only for personal transport, were also eliminated.

There still seems to be a shady zone around car- and bike-sharing systems, which have been, at some times classified as "new public transport systems" [Kaltenbrunner et al., 2010] or "innovative transportation modes that complement public transport" [Huwer, 2004], as a hybrid, a "public-private transportation modes" [Firnkorn and Müller, 2011] and at other times were seen only as a shift from ownership to service, but remained an individual, private transport mode. In this classification car and bike-sharing systems were considered as part of the public transport system, and were not excluded from the study.

The identified articles were screened twice, once only using the titles and keywords, and afterwards by reading the abstracts, to eliminate all articles that fulfill the rejection criteria.

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The systematic literature review was then repeated using the keywords "public transport" AND "low cost" in the same three scientific databases, and using the same timeframe, from 2006 to mid-2013.

The rejection criteria used for this second review were the same as the ones used previously, but with a different inclusion criteria: to be part of this database the articles should be on low cost or cost reduction. Once again this was assessed by author self-evaluation and we included articles that contained the words 'low(er) cost', 'cost reduction', 'cost efficiency', 'cost minimization', 'cost savings' or 'affordable costs'.

3.2. The field application: Screening innovation initiatives for low cost public transport in a French public transport operator

Public transport operators often face difficulties to create innovative solutions, which are often justified by the lack of incentive in public services to innovate, the great number of actors in this industry, amongst others. This was also the case of RATP, a French public transport operator, who wanted to renew its offers and propose a new "low cost" or entry product that would allow it to be competitive outside its current market. To do so, they launched a research program on low cost products that is composed of three different phases:

- A benchmark on existing low cost product and services;
- An oriented creativity method, the KCP method [Elmquist and Segrestin, 2008], composed of three phases itself: a Knowledge sharing phase (K), a Conceptual exploration phase (C) and a Prototype and proposition phase (P). This method supported coordination of a transversal group of 25 employees of different departments, who participated in the K and C phase, and a smaller group of experts who participated in the P phase.
- A project development phase, during which the propositions from the P phase of the oriented creativity method were elaborated and developed by the different departments concerned, having as goal to create low cost offers.

At the time of this writing, the project development phase is still in progress, so the final results of the projects could not be discussed here. Nevertheless, the motivations for innovation, which are the focus of this article, are already well-known, and will be discussed further on for each one of the five propositions that were made at the end of the oriented creativity phase.

The method used here was an action research [Coughlan and Coghlan, 2002]: the authors participated in all these research phases, contributing to the benchmark, as well as to the animation of the KCP and to the development of the projects.

4. Data Analysis

4.1. The main innovation motivations identified in the systematic analysis

This search allowed us to find 1594 articles in the ScienceDirect database, 96 additional articles in the Web of Knowledge database and 26 others in the TRB database (the decreasing number of articles is a consequence of the large similarity of rough results between the databases and of the decreasing number of journals in each base). By applying our rejection criteria and excluding identical articles, we were able to reduce the number of articles to 94 (67 from the ScienceDirect database, 18 from the Web of Knowledge and 9 from the TRB database). The articles were catalogued in a unique database and classified according to their motivations for innovation. We identified 16 motivation categories, sometimes used in combinations (see occurrences in table 1), which are described in table 2.

Table 1. Number of different motivations indicated by authors in each article

Number of motivations	Occurrences	% of the panel
1	40	43%
2	37	39%
3	13	14%
4	2	2%
5	1	1%

Table 2. Motivations for innovation in public transport from 2006 to mid-2013

Motivation for innovation	Description	Occurrences
Environment/sustainability - climate change and pollution	Encompasses the fight against climate change and reducing greenhouse gas emissions and/or reducing pollution, as well as the dwindling resources problem.	46
Policymaking and legislation	The public transport sector is highly affected by public policies and legislations, since it's a public service, often receiving high levels of subsidies.	34
Technology change	Several technological developments linked to public transport can be observed, ex: energy recuperation from braking. This theme does not take into account the new information and communication technologies.	19
ICT	Contains the works about innovations in information and communication technologies.	12
Organisation and management	The way transport operators and transport networks are organised differs from city to city and has a clear impact on the effectiveness of the transport system.	12
Users Behaviour change	The adoption of innovations in the public transport sector can often only be achieved by making the customers and users adopt new behaviours.	11
Public-Private-Partnerships (PPP), contracts, tendering and financing	Different contracting and financing schemes emerged recently, and collaboration between the public and the private sector are multiplying in this sector. Treats aspects linked to how public and private sector interact.	6
Low cost, cost reduction and cost effectiveness	Cost reduction is a rising concern in all public services.	5
Modelling and methodologies	In order to better design new transport networks or to evaluate the impact of changes on existing networks, these must be modelled or tested. Considerable efforts are put into improving these models	5
Service quality and client satisfaction	This group contains those studies motivated by improving service quality and client satisfaction.	3
Social inclusion	Social inclusion and giving access to services is one of the main goals of public transport.	3
Physical accessibility and universal design	As most services, public transport has a physical accessibility issue, which is widely discussed. The distance between public transport stops, as well as vehicle and station design to allow the use by the broadest variety of client profiles is taken into account here.	2
Improving transport safety	The passengers and operators safety is a major concern in public transport.	2
Pricing strategies	Public transport is often seen as a public service. The price therefore does not, in many cases, reflect the real cost of the service produced. However, different pricing strategies (like different pricing for certain hours) can be used to shift demand or to increase ridership.	2
Improving public health	A series of public health issues are linked to public transport or could be improved by the use of public transport, like traffic accidents, stress-related diseases due to the crowding, or diseases linked to the pollution.	2
Travel Information	Travel information has been identified as one aspect that increases public transport ridership.	2

Table 2 lists the number of times each motivation occurred. Each article had one or more motivations cited in the title, abstract and keywords. Providing a unique motivation was the most common configuration, but two motivations were also very common (see table 1). Only 10 articles (11% of our sample) did not use one of the five main motivations.

4.2. The main cost reduction paths identified by researchers

The scientist databases search on "low cost" and "public transport" allowed us to find 1059 articles in the ScienceDirect base, 13 additional papers in the Web of Knowledge base and 30 in the TRB base. Of these, 408 had also been identified in the first systematic review. When applying the rejection criteria, the number of articles was reduced to 49 (46 issued from ScienceDirect, 1 from the Web of Knowledge and 2 from the TRB database). Table 3 shows the different motivations for cost reduction.

Table 3. Motivations for cost reduction in public transport from 2006 to mid-2013

Motivation for cost reduction	Additional motivation description	Occurrences
Low cost, cost reduction and cost effectiveness		49
Modelling and methodologies		15
Policymaking and legislation		11
Benchmarking and comparing networks	Some cost reductions are linked to easily replicable productivity efforts. Best practices and comparisons between networks are therefore an important part of the cost reduction effort.	9
Environment/sustainability - climate change and pollution		9
Organisation and management		9
Socio-economical advantages	As a public service, the benefits of public transport are not only measured by financial criteria. In the interest of winning tenders or increasing the satisfaction with the current government other socio-economical advantages are often important.	6
Technology change		6
PPP, contracts and financing		5
Social inclusion		3
Behaviour change		3
Improving transport safety		3
ICT		2
Combining transport modes	A transport mode is defined by a vehicle, an infrastructure and a specific operation. Combining modes consist of trying to assemble parts of two different modes.	1
Travel information		1
Physical accessibility and universal design		1
Reliability	Unreliable services (experienced by users mostly by lack of punctuality and inconsistency of time travel) are less attractive for users, leading to decreased ridership by unsatisfied users. A level of reliability can also be part of the transport contract, and fines for unreliability can increase costs for operators.	1
Improving regularity	In frequently served transport routes, users are more concerned by regularity than by punctuality at a stop.	1

In this sample of articles, 18 different motivations were identified, 13 of these had already been identified in the motivations on innovation. The five additional motivations are: Benchmarking and comparing networks, socio-economical advantages, combining transport modes, reliability, and improving regularity.

Table 4 underlines the number of motivation besides low cost and cost reduction cited. The five main motivations besides low cost are not used in 10 (22%) of the articles.

Table 4. Number of different motivations besides "low cost" cited by article

Number of motivations	Occurrences	%
1	26	53%
2	13	27%
3	7	14%
4	2	4%
5	1	2%

The systematic review also allows confirming the gain in importance of low cost during the studied period, with a significant increase in number of publications from 2011 (see Figure 1).
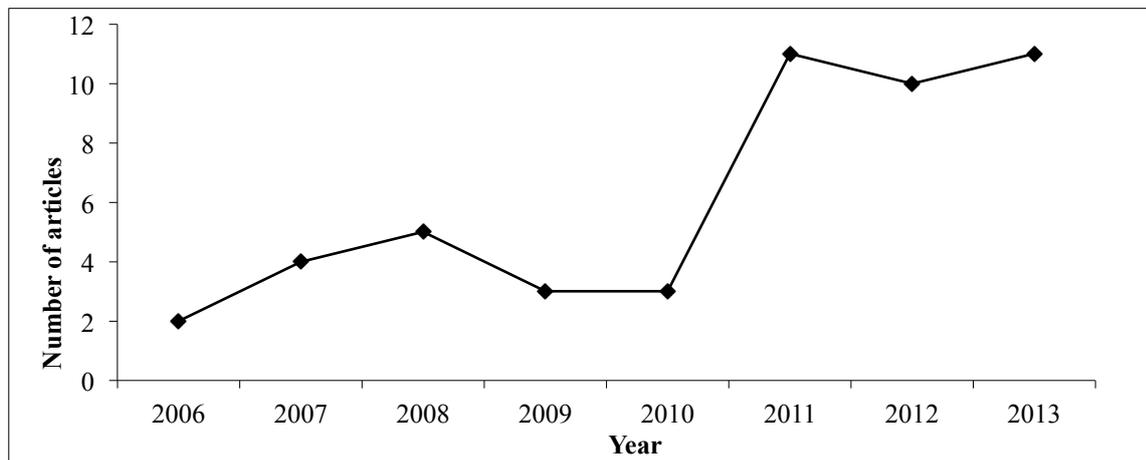

Figure 1. Publication trend for articles on low cost public transport

4.3. The public transport operators projects analysed through the framework of scholars' motivations

As mentioned in section 3, the oriented creativity method resulted in five internal propositions within the French public transport operator. Each proposition was composed of a concept addressing a specific innovation path within the low cost field, and a set of studies, projects and trials that had been identified to develop and achieve the exploration of the concept.

One of the developed propositions consists of replicating the learning of low cost airlines model to the public transport. As was done by the low cost airlines, this consists of re-evaluating the client satisfaction and the service quality, to allow the removal of all product aspects considered by the client as adding poor value compared to their cost. The different motivations for this proposition (listed in table 5 as proposition 2) are:
1. Low cost, cost reduction and effectiveness, since the main initiative's aim is to reduce costs;
2. Service quality and client satisfaction, since the goal is to better adapt the transport to the client's expectations;
3. Social inclusion, because the new offers should allow access to the service for non-customers;
4. Benchmark and compare networks, since the service quality is different according to the network and the comparison is important.

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It appeared that all propositions tackled both motivations for cost reduction and motivations for innovation. Table 5 shows the number of motivations that will be combined in each of the propositions made. The various combinations of multiple motivations are really interesting for the firm as it allowed both dedicated and original strategies of learning, and to adapt activities to stakeholders' interests in order to support their involvement.

Table 5. Number of different motivations by proposition

Proposition	Number of motivations
1	9
2	4
3	5
4	3
5	5

Moreover, the coverage of motivations tackled by the French operator was surprisingly broad: 15 of the 21 motivations identified through the two systematic reviews will be taken into account in the propositions. Table 6 recapitulates the different motivations addressed by these five propositions.

Table 6. Coverage of RATP's propositions by motivations

Motivation	Propositions
Low cost, cost reduction and cost effectiveness	1,2,3,4,5
ICT	1,3,4,5
Service quality and client satisfaction	1,2
Social inclusion	1,2
Benchmark and compare networks	2,3
PPP, contracts, tendering and financing	4,5
Technology change	3
Behaviour change	1
Policymaking and legislation	5
Travel Information	1
Modelling and methodologies	1
Organisation and management	5
Pricing strategies	1
Reliability	1
Combine modes	3

5. Findings

This study allowed us to identify the main innovation motivators in urban public transport through a double validation of scientists' works predominance and an industrial case analysis. The three main innovation motivations that were expected by doing a narrative literature review – environment and sustainability, policy making and legislation, technology change - were confirmed by the systematic review of the main scholars database for public transportation research, however this study also underlines that they are not the only ones: 13 other innovation motivations exist, which are usually tacit or undervalued.

Although the studies on low cost public transport are rarely linked to innovation (only 5 of the articles appeared in both of the systematic reviews after the application of the rejection criteria), the motivations in both studies are rather similar: a common core of 13 motivations exists. This extended list of common motivation is a significant result to improve strategic exploration of innovation within

a low cost paradigm. Moreover, five motivations linked specifically to low cost were also identified, that could also enrich the innovation quest.

As they are of common knowledge, the three main innovation motivations had already been identified as important innovation paths by the public transport operator, and numerous activities already existed in those paths before the oriented creative method: projects aimed at improving the environmental performance and sustainability of the transport system were previously underway, and there is even a sustainable development department in the company. Technology change and ICT were also well-known paths for practitioners as major motivations for innovation. At the opposite, Innovative policymaking and legislation was identified by the French firm as being a risk outside the companies boundaries, and therefore to be followed carefully, but they did not consider it as a potential innovation source. Similarly, cost reduction efforts existed throughout the whole company, but they were most of the time not linked by decision-makers to innovation and therefore carried out by each department, often without the possibility to influence the others.

The fact that low cost was inscribed in the innovation agenda allowed the operator not only to gather the different departments and to create a coherent cost reduction agenda for the whole company, but also to work on a series of combinations of motivations that are broader than those seen in our systematic research. This had a twofold managerial implication: (1) to treat innovation paths that were today unexplored and hard for the company to justify by other means; (2) to cover a maximum of identified innovation motivations.

The fact that several different motivations were targeted through a same proposition, also made it easier to interest different departments in the projects. A greater number of departments was for example willing to work in the projects issued from the first initiative, which had 9 different motivations, than in the projects issued from the fourth, that only had 3 motivations. And all the initiatives had more interested departments than is usually the case in the innovation and cost reduction projects suggested by the individual departments.

Since resources are limited, treating all the innovation and cost reduction motivations was impossible. The environmental and sustainability motivation was willingly left out, since the company through its dedicated department already treated it. The other five innovation motivations that were not investigated by the propositions have now been identified, and their integration into the research and innovation program might be the object of further propositions.

6. Conclusion, managerial implications and further research

The first conclusion that can be drawn from this work is that a large framework of innovation motivations exists in public transport, not only the three most discussed in literature. This structured study explicit them and it might support decision makers and managers in this sector to decide which motivations for innovation are most important to them. Doing so, this research addresses the key issue of the lack of innovation in the sector and provides relevant data on what really counts to drive public transport innovations. A better understanding of these points is a first step to tackle this problem.

Secondly, an increase in concerns with low cost and cost reduction can be observed in this sector. However cost reduction still seems to be reached only by productivity and operational effectiveness. Consequently, a potential of cost reduction linked to innovation (and not opposed to it) is under-explored in this domain. One of the few examples of successful cost reduction linked to innovation in public transport is the Bus Rapid Transit (BRT). This study shows that linking innovation and low cost can increase efficiently the available options to achieve the so needed low cost public transport.

Furthermore, not only can low cost innovations allow a wider number of cost reductions, but they can also serve as a powerful catalyst to innovate in other domains. As was the case of the French public transport operator we studied, who launched projects with several innovation motivations, other actors in this sector could also combine efficiently the low cost and innovation motivations. This would allow to explore domains that are interesting for them but whose exploration might be hard to justify in the company or to other stakeholders.

Nevertheless, several limitations to this study exist. In systematic literature reviews there are two essential points, they are the strategy of locating and selecting the potential studies and the inclusion / rejection criteria. The first limitation of this study is linked to the way the articles were chosen. Since

public transport, innovation and cost reduction are subjects discussed in a very transversal literature (including transport revues, economy revues, management revues, policy revues…) and the searched databases were chosen to cover the main important transport revues, some sources have surely been left out. The study could be broadened by including other data sources, also covering the main revues in innovation and in management. The second limitation of this study is linked to the inclusion criteria. The criterion for selecting studies on innovation was the authors' self-declaration. As discussed in section 2, different definitions and usages of the word innovation exist. To be sure that the greatest number of innovative public transport systems are taken into account, it would be interesting to rescreen the articles by verifying the innovativeness of all the products and services proposed through the same framework. Finally, transport operators are only one type of actors in the domain of urban public transport. Looking into field cases of other actors, like vehicle manufacturers, infrastructure builders or legislators, would also be an interesting way to broaden this study.

References

Badami, M. G., Haider, M., "An analysis of public bus transit performance in Indian cities", Transportation Research Part A: Policy and Practice, Vol. 41, 2007, pp 961 – 981.

Becheikh, N., Landry, R., Amara, N., "Lessons from innovation empirical studies in the manufacturing sector: A systematic review of the literature from 1993-2003", Technovation, Vol. 26, 2006, pp 644 – 664.

Christensen, C., "The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail", Harvard Business School Press, 1997.

Costa, A., Fernandes, R., "Urban public transport in Europe: Technology diffusion and market organisation", Transportation Research Part A: Policy and Practice, Vol.46, 2012, pp 269 – 284.

Coughlan, P., Coghlan, D., "Action research for operations management", International Journal of Operations & Production Management, Vol. 22, 2002, pp 220 – 240.

Delle Site, P., Filippi, F., Giustiniani, G., "Users' preferences towards innovative and conventional public transport", Procedia - Social and Behavioral Sciences, Volume 20, 2011, pp 906-915.

Firnkorn, J., Müller, M., "What will be the environmental effects of new free-floating car-sharing systems? The case of car2go in Ulm", Ecological Economics, Vol. 70, 2011, pp 1519 – 1528.

Garcia, R., Calantone, R., "A critical look at technological innovation typology and innovativeness terminology: a literature review", Journal of Product Innovation Management, Blackwell Pub., Vol. 19, 2002, pp 110-132.

Hyard, A., "Non-technological innovations for sustainable transport", Technological Forecasting and Social Change, Vol. 80, 2013, pp 1375-1386.

Huwer, U., "Public transport and car-sharing - benefits and effects of combined services", Transport Policy, Vol. 11, 2004, pp 77 – 87.

Kaltenbrunner, A., Meza, R., Grivolla, J., Codina, J., Banchs, R., "Urban cycles and mobility patterns: Exploring and predicting trends in a bicycle-based public transport system", Pervasive and Mobile Computing, Vol. 6, Issue 4, pp 455-466.

OECD, "Proposed guidelines for collecting and interpreting technological innovation data: Oslo manual", OECD, Paris (Second (revised) Edition) , 1997.

Ongkittikul, S., Geerlings, H., "Opportunities for innovation in public transport: Effects of regulatory reforms on innovative capabilities", Transport Policy, Vol.13, 2006, pp 283 – 293.

Porter, M., "What is strategy?", Harvard Business Review, November-December, 1996, pp 61 - 78.

Pucher, J.; Park, H. & Kim, M. H. "Public Transport Reforms in Seoul: Innovations Motivated by Funding Crisis Journal of Public Transportation", Vol. 8, 2005, pp 41 – 62.

Radjou, N., Prabhu, J., Ahuja, S., Roberts, K., "Jugaad Innovation: Think Frugal, Be Flexible, Generate Breakthrough Growth", John Wiley & Sons, 2012.

The World Bank, "Safe, Clean, and Affordable… Transport for Developpement – The World Bank Group's Transport Business Strategy for 2008-2012", Washington, DC, 2008.

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