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Procedia Social and Behavioral Sciences 2 (2010) 6229–6241

Procedia
Social and Behavioral Sciences

The Sixth International Conference on City Logistics

A methodology for the evaluation of urban logistics innovations

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Abstract

This paper discusses a methodology to increase the consistency with which urban good innovations and projects are evaluated. The methodology has been developed in France and is based on a detailed examination of 15 projects comparing the wide range of criteria used in their evaluation. Following the discussion of the methodology and a summary of how it was devised the paper goes on to show its application to two projects, one in France involving mail and small package deliveries and the other in the UK involving an urban consolidation centre for retailers. Using the two case studies demonstrates the application of the methodology and also shows some of the challenges in terms of data acquisition. The paper concludes by considering the value of the approach and outlining further research needs.

Keywords: Evaluation; projects; innovations; urban goods

1. Introduction

The paper has two main purposes. The first is to discuss the scope for the development of a consistent methodology to evaluate the benefits of innovative city logistics experiments and pilot projects. The methodology proposed is based on a detailed analysis of 15 experiments carried out in France during the past 10 years. The method is innovative in the sense that it proposes a rigorous evaluation that is clear and consistent and can be applied to any city logistics innovation. It takes account of the diversity of stated objectives and the various fields of applications. About 60 data items and ratios permit full consideration the impacts covering social (equitable), economic (viable) and environmental (liveable) features of the innovations. Both quantitative and qualitative features can be considered. The second goal of the paper is to explore whether this methodology can be applied in a non-French context. For this part of the research we have chosen to apply the methodology to a city logistics trial that has taken place in the UK (i.e. the urban consolidation centre in Bristol). The discussion in the paper is intended as a contribution to the on-going research into evaluation frameworks that can be used to identify success factors for

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1877-0428
doi:10.1016/j.sbspro.2010.04.033

city logistics initiatives. It can also be seen as a first step towards creating a software tool that could be widely disseminated to the public sector, to project initiators and to those concerned with financing the initiatives.

Over the past 10 years numerous projects and innovations have been carried out in order to improve urban logistics. The main aims were to reduce motorized traffic and thereby reduce CO_2 and greenhouse gas emissions in urban areas. The innovations can be classified under three headings:

- Consolidation of goods flows within the urban area (achieved through new organisation or new concepts such as consolidation centres);
- Use of new non (low) polluting vehicles (e.g. electric powered vehicles);
- Regulation (usually focused on restricting certain types of activity by time of day, size/type of vehicle).

In European cities, more than 100 experiments have been carried out (BESTUFS, 2008). Yet despite all this activity it remains impossible to fully evaluate their efficiency and to compare them. In many cases the methodologies employed in the feasibility and follow-up analyses are not similar and in addition the observed units and measurements are frequently found to be different from one implementation to another. At a very simple level this can result in problems, for example some implementations are assessed based on reductions in vehicle trips while others may be assessed considering changes in vehicle kilometres. A number of authors have noted the importance of evaluation and the need for guidelines (see for example Thompson and Hassall, 2005 and van Duin et al., 2007). It is also the case that certain experiments and initiatives have been evaluated (see references). However, full details of the methodologies employed and the underlying data often remain confidential, there is limited justification provided for the choice of units observed and monitored in relation to the agreed objectives of the project. Impact evaluation often considers only the post-implementation aspects and does not take account of the ex-ante situation. The current paper attempts to make an original contribution to this field.

Having a consistent evaluation methodology could be used to provide an ‘award’ or a ‘sign of approval’ for experiments and innovations that meet the intended goals. In this way (over time) it would be possible to ensure that public funding support was targeted at the most appropriate initiatives and projects. The methodology needs to be applicable to a wide range of projects and actions that can be categorised under the headings of, new organisational modes/structures, regulation, new urban logistics areas, new transport equipment/vehicles and new concepts.

Urban logistics remains a field where there is a need for more analysis in order to understand the implications of innovative developments and changing practices. A major contribution could be made by evaluating the various experiments, both to assess their efficiency and to find the important features that may need to be changed to make them transferable. A thorough and detailed evaluation would provide the foundation for further new projects. To achieve this effectively the private actors need help from the public sector (in terms of financial support in some cases and possibly in the development of regulation). The exchange of ideas and the creation of public private partnerships are useful steps in this process. The role of evaluation can be to show the win-win aspect of the partnership in accordance with the goals of sustainable development (i.e. reductions in costs and reductions in environmental impacts).

This paper is intended to contribute to the goal of achieving more consistent and robust evaluation approaches in the important filed of city logistics. As noted above, private initiatives often need direct support from the local community or authority (e.g. administrative authorisations, changed rules and regulations, financial support, other measures etc). It is necessary to show that private interests are not inconsistent with public interests. The evaluation of a project should be designed to show the effectiveness of the project, the extent to which it can be adopted elsewhere in the same form, the role of the participants and the conditions needed to achieve the objectives. The evaluation should highlight the variables that must be analyzed to quantify the effects related to its implementation based on the pillars of sustainable development.

This paper is in two main parts. The first part of the paper (see next section) will present a methodological guide aimed at achieving a unified evaluation approach using the same units of assessment and the development of a matrix that takes account of the key ratios that need to be considered within the evaluation approach. The second part of the paper considers the application of this methodology by testing it with evaluations of two experiments one from France and the other from the UK.

2.1. Prerequisites and initial steps

Some prerequisite are necessary to achieve a thorough and appropriate evaluation. The first step takes account of the socioeconomic context and main trends (ageing of the population, increasing energy costs, local policy etc) then the following actions are necessary:

- To carry out an ex-ante analysis: to take stock of the situation, to analyse the evolution, with and without the innovation, to take into account the targeted objectives;
- To evaluate the global supply chain (upstream and downstream). Often, the evaluations take into account only the link where the innovation takes place;
- To show clearly the bias established by specific choices or the services' users;
- To ensure the confidentiality of commercial data;
- To identify the constraints of the scope of the project;
- To identify the projects which combine several types of innovations (the effects can be added or can, in some cases, cancel each other out).

The methodology that is used in this paper is based on work carried out within the PREDIT Programme of National Research (see Patier et al., 2008). Specifically it is based on an analysis of 15 French experiments in urban distribution carried out during the past ten years. The evaluation of these urban logistics experiments has been conducted by ten different consulting organisations. As a result it is not surprising that some of the units of measurement used and indeed the evaluation approaches are rather different from one report to another.

In order to develop the methodology it was necessary to review each evaluation report in detail and to establish an inventory of the parameters used followed by a classification of their effectiveness and efficiency regarding the objectives they pursued. Using results from the evaluation of the experiments some basic data have been collected (including: variable, indicator, or macro-variable). With respect to terminology, the paper uses the following definitions. We recall that the variable is the measurable data collected (e.g. number of vehicles), the parameter is a variable that is used to make a measurement for a specific purpose, the indicator is the value of a relevant parameter used to assess and monitor the characteristics of particular field, the ratio is the result of a relationship between variables measured (e.g. number of vehicles / capacity of a platform = utilization rate of the platform).

The methodology adopted to review the evaluation studies is not based on a simple typology of innovations, but on a classification by "elementary particles" (i.e. considering a fine granularity of detail). This classification appears in the following chart (Figure 1) which summarizes the evaluation chain of a project, its design, its beginning (where ex-ante evaluation is essential) and its follow-up including the ex-post evaluation.

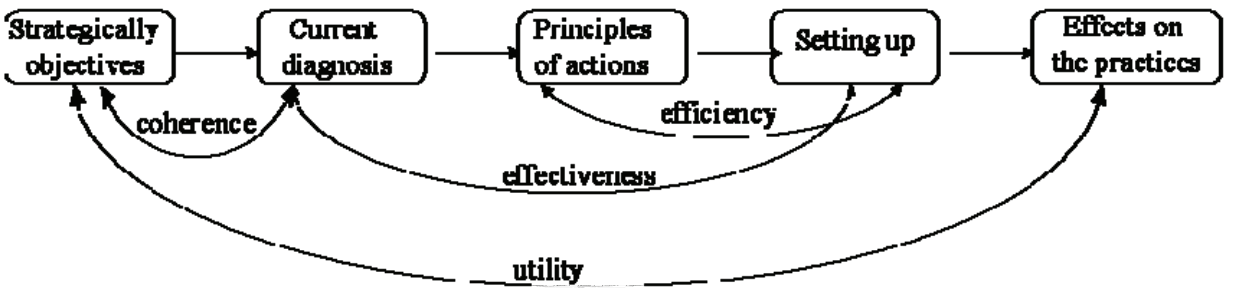


Figure 1 Steps of the implementation, (Source: Boudouin, 2006; referred to in Patier, 2007)

The next step in developing the methodology guide resulted in the construction of a table or matrix with the 15 experiments/projects listed vertically and the variables and key ratios noted horizontally. The process involves 5 steps:

i. Construction of a reference grid based on the multi-criteria evaluation of the grid, "taking into account sustainable development" in the projects (see CERTU Réseau Scientifique et Technique, RST02 Department of Planning, 2006). Sixty five variables in total were selected for this evaluation. The variables and ratio have been categorised among three classical categories concerning sustainable development: economical, social, environmental. Then with further categories such as equitable (interface between social and economical), feasible (interface between economic and environmental and liveable (interface between environmental and social) (see Figure 2).
ii. Placing the variables presented within each project in the table (see Table 1).
iii. Indicators have been added in order to take into account the variety of experiments and/or the objectives of the projects. Each variable has then been assessed in order to classify it based on the importance (essential - 3, i.e. necessary and sufficient, important - 2, i.e. necessary but not sufficient, contextual - 1, i.e. optional and contextual). At the end of this process an initial tabulation is obtained, (see example in Table 1).
iv. Having completed the initial tabulation it is necessary to assess the score for each line, finding the total and then arranging the lines in order of decreasing importance (see Table2).
v. Within the matrix, the occurrence of each variable on the line is added, (second column), and the occurrences up to 2 (third column) (see example in Table 2).

This classification allows us to distinguish a number of core indicators and two other less important levels of indicators (see Table 2). Two further tests have been conducted in order to investigate the validity and the stability of the obtained score. The process involves considering the number of times the indicator is mentioned compared with the ‘score’ given to the indicator.

The end result of this approach in terms of the indicators developed for the analysis has been summarised in Table 3. They have been selected in 2 parts, core and additional indicators. Core indicators have to be taken into account whatever the experiment. Their presence in the evaluation is the guarantee of a good analysis. The other indicators improve the quality and can be necessary in some of experiments depending essentially on the context.

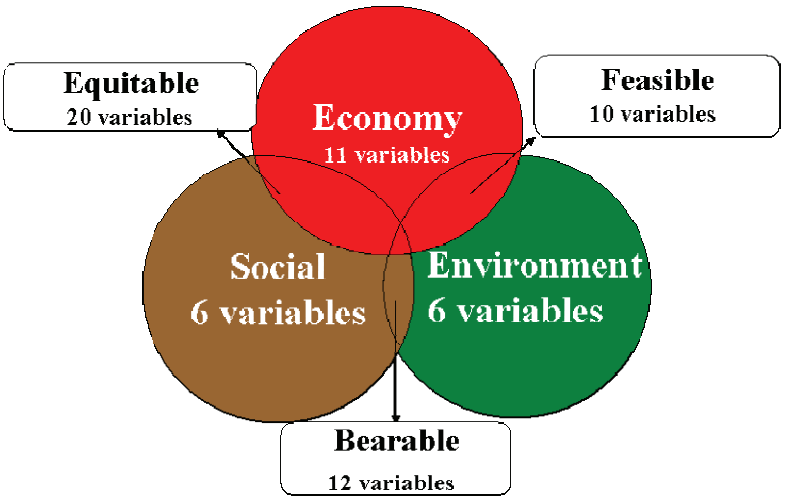
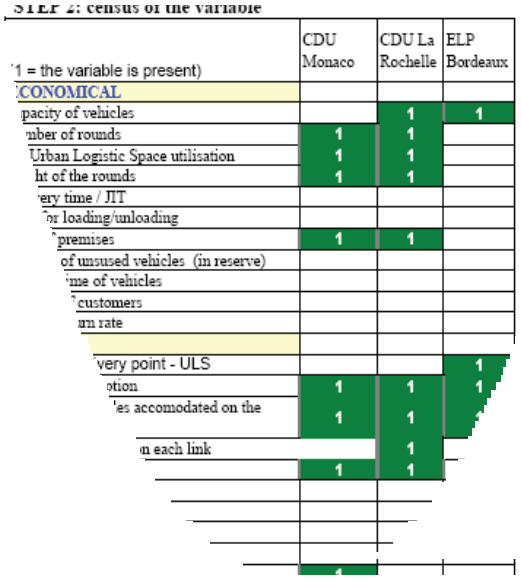


Figure 2 Categories of variables



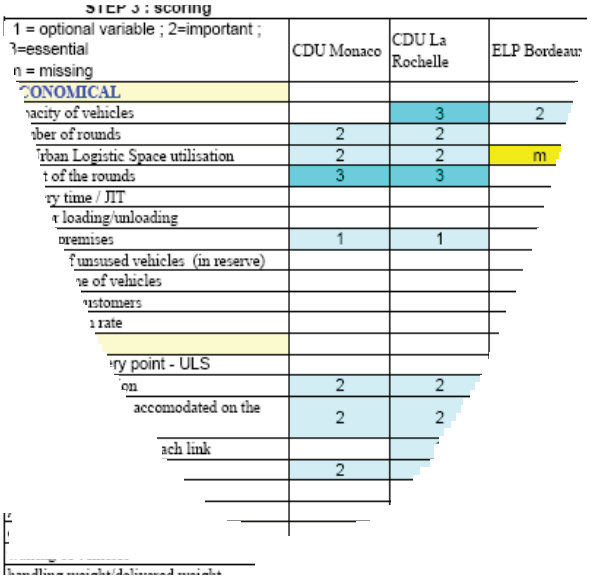


Table 2 Results of scoring and last classification

Type of variable	…Equitable...	Total	occurrences on ligne	occurrences > 2
C	subsidiaries/repayable advances,	28	10	10
C	investment costs	26	11	9
C	Functionning costs	25	12	8
L	*number of parcels*	21	8	8
C	visibility of the firm	20	10	9
C	costs of services	20	9	7
C	(Q) customers and u satisfaction	19	9	8
C	number of custome	18	9	7
L	*number of position*	16	7	6
S	(Q) safety	13	6	5
C	*(Q) typology of a* ies	12	5	5
C	(Q) customers n	11	5	
L	*(Q) typology of goods*	10	5	
C	evolution of th benefit	10	7	
C	Wage bill/tu	9	4	
L	*number of p*	8	5	
	frequency	3	1	
	(Q) seasor		2	
	share of prestati		1	
	number of billed hours	1		

Table 3 Table of indicators (Source: Patier et al., 2008)

	Core	Additional
Logistics data	Number of delivered or picked up parcels Number of stops Duration of stops Action zone Distance coveresd by road with thermic vehicles Distance covered with non polluting vehicles Vehicle and handling equi^pment capacity Number of vehicles crossing on the platform %using rate of the urban logistics space	Length of the rounds Delivery time, cnstrainsts of deliveries (just in time) Time for loading/unloading Number of trucks on each link Filling rate of the vehicles Speed of vehicles Timetable in the platform Timetable for each stop for delivery
Economical and Commercial Indicators	Investments costs Exploitation costs Subsidy, aides, repayable advances… Price Customers or user's satisfaction Visibility of the project	Subcontracting Safety of the freight Typology opf concerned activities Typology of involved goods Motivation of customers Evolution of the turnover Evolution of thr exploitation results
Environmental indicators	Energy consomption Pollutants emissions Rate of deliveries wikth clean vehicles	Noise
Social indicators	Working condition/ergonomic Employment/Number of deliverymen Formation/insertion	Time of employees trips Evolution of careers Working schedule Mode of transport of the deliverymen Working safety
Specificity regulation	Authorised deliveries/not allowed deliveries Road ovccupancy Time of "restricting parking	Conflicts betwwen users of the space

2.2. Summary

The central aim of the methodology proposed is to find a way to harmonise the evaluation approaches adopted when considering urban goods projects. This is achieved by identifying all the variables used in the evaluation carried out by different consulting organisations, and then applying the methodological approach noted above in order to observe the relative importance of what has been achieved in each project/experiment. As noted earlier in the paper, the methodology discussed above has been developed with reference to a number of urban logistics projects carried out within France. The following section of the paper discusses the application of the methodology in the context of the Chronopost project within France and the Urban Consolidation Centre in Bristol.

3. Application of the Methodology

This part presents a test of the methodology. It tries to answer some important questions:

i. Is the core data available for a typical evaluation?
ii. Having listed the data, is it possible to classify the quality of evaluation regarding their global efficiency?
iii. Is the methodology universal?
iv. Are the data and evaluation standards similar in UK and in France?
v. Can the procedure be useful to help the start up for a new experiment (upstream)?

The final score obtained indicates the quality (depth) of the evaluation. The evaluation that is scored most highly will be that which has taken account of the essential variables in relation to the stated objectives and that takes account of the situation ex-ante/ex-post. We have intentionally chosen two rather different experiments in order to conduct an initial cross-national test of the methodology. In France, a new concept of urban vehicle used from a small urban logistics centre. In UK, the UDC in Bristol that serves the retailers in Broadmead shopping mall using a

conventional medium-sized truck for the delivery into the city. When a variable is analysed the same value is consistent for each experiment and thus the outcomes can be compared.

3.1. The Paris case

In Paris, Chronopost (subsidiary of the French Post) carried out an experimentation based both in a new organisation for pick-up and deliveries of parcels and new vehicle use in the hyper centre of Paris, Place de la Concorde. The objectives were to meet new quality requirements in a triple perspective of optimal profitability, quality of service and reducing CO_2 emissions.

The previous organisation: 20 commercial vehicles started from the Bercy Platform (10 km from Place de la Concorde) to perform numerous deliveries in two districts of Paris returning empty. The platform is located in an outlying district. The consolidation takes place early in the morning, that makes it impossible for the delivery persons to use public transport, therefore they travel from home to their place of work by car.

Current organisation: A small urban logistics area (950 m²), located in the Place de la Concorde underground car park is rented by the Paris authorities with a "logistics cost" (i.e. the price charged for rental is lower than the market price that could be achieved). It provides the last mile distribution of goods in the two districts, as it was, with 14 electric vehicles, two "Chronocity" and some subcontracting. "Chronocity" is a new concept of urban vehicle developed by Chronopost, it uses electric trolleys that have a 12 hour range, 1.3m^3 and 300kg load capacity. The delivery person completes the round on foot. Figure 3 shows the platform and the organisation before and after the urban logistics experiment.

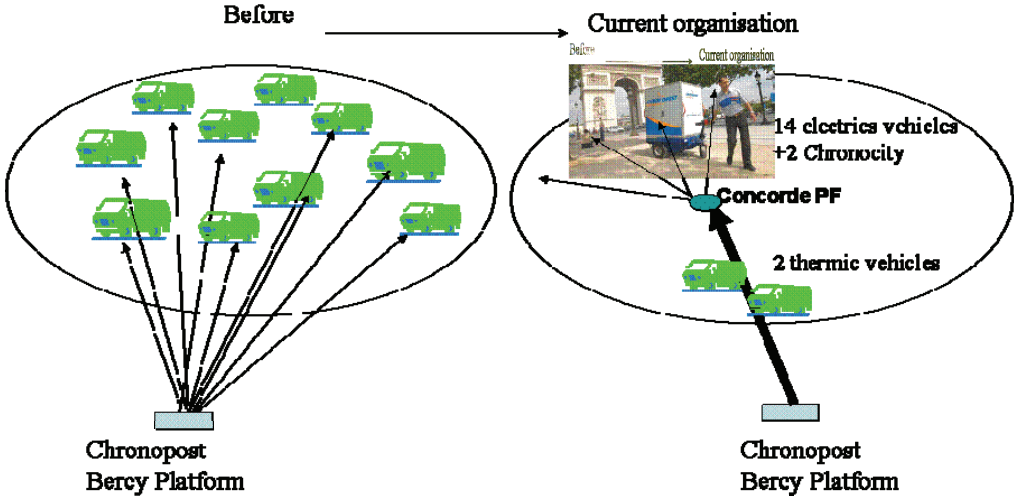


Figure 3 Chronopost experiment in Paris (Source: Chronopost)

The evaluation carried out by the company Grant Thornton Consulting concerns 6 months of activity, one year after the start of the project. We will compare the items which have been taken into account during the evaluation with the global table of indicators shown in our methodology scheme.

3.1.1. Phase 1. What data were observed?

3.1.1.1. Economic and financial data before/after:

- Number of vehicles/type,
- Distance covered before/after experiment (same service/type of vehicle),
- Rounds: number/day and number of parcels/round,

- Parking place used,
- Share of parcels delivered from urban logistics space,
- Share delivered by clean vehicles, by Chronopost and by subcontractors,
- Share of parcels transferable on the urban logistics space (capacity of ULS),
- Choice of subcontractors,
- Financial tying up (tools, equipment, furniture, installations,),
- Cost of alteration works in the parking,
- Functioning costs,
- Share of subsidies (partnership),
- Maintenance of the vehicles: frequency/distance, time of immobilisation, rate of replacement, and
- Mode of transport for deliverymen (home-work-home) and average duration of the trips.

3.1.1.2. Environmental data before/after

- Energy consumption for the thermic vehicles (litres of fuel) and value in Euro,
- Energy consumption for the electric vehicles (Kilowatt hours) and value in Euro,
- CO_2, pollutants, greenhouse effects, emissions linked with the logistics organisation before/after (base: distance covered and type of vehicles and number of vehicles),
- Acoustic emissions, and
- Qualitative aspect: safety, comfort for driving, wearing of the batteries.

3.1.2. The evaluation results based on six months

The evaluation is based on a comparison between the ex-ante and ex-post situations. We present the main results in terms of economy, finance and environment after 6 months:

3.1.2.1. Economic results

- The distance covered in thermic vehicles decreased from 68941 km to 16970 km (-75.4 %),
- 20 000 km have been realised with “Chronocity”, on foot,
- 179 460 parcels have been delivered in 6 months. It is about 14 % of total deliveries in the 2 district of Paris (9.1% on foot with Chronocity),
- To deliver, 70 points are concerned per day and per delivery person, 21 for the pick-ups,
- The cost/km with electric vehicles is evaluated to be 14.34 ct €/km,
- The total investment costs have been more than 500,000 euros (fittings, vehicles, rental, etc). The subsidies have been from Paris authorities and EDF (electricity supplier). The part of the Mayor of Paris is 36% of renting platform cost; subsidies of EDF concern fittings. The subsidies are decreasing and will stop soon.
- 77 % of managing costs are due to the electric vehicle rental.
- The economy realised on energy consumption (difference between previous and current organisation and transfer from diesel vehicles to electric vehicles is more than 3500 Euros/6 months.
- The part of subcontracting decreased from 88% (previous organisation) to 34.5%. The evaluation of the subcontracted deliveries which cannot be transferred to own account is 29%.
- The costs/parcel delivery from the platform is 17% more expensive than the subcontracted delivery, but globally the total costs are similar.

3.1.2.2. Environmental effects

- The energy consumption saving integrates both the electric vehicle consumption and the urban logistic area consumption. Concerning directly the vehicle, the calculation is based on the hypothesis of manufacturers and a coherence control with the total consumption of the Urban logistics space where the vehicles are recharged;
- The evaluation of pollutant emissions and saving between the two organisations has been carried out with the Copert software ADEME (Energy National Agency). The emission and saving of greenhouse takes into account the increase of electric consumption according to the urban logistic area and the electric vehicles use. This is 16.8 tons of CO2 (-59 %);

- The decreasing of pollutant emissions during the rounds is 75%. The CO2 emissions decreased from 36.5kg to 9kg, NOx from 86 to 21.2kg, COV from 7.1 to 1.8Kg, and the particles from 5.2 to 1.3kg;
- The evaluation of acoustic nuisances has been realised with a comparison with the whole city thanks to the standard of the urban ecology service (Paris town council). The delivery persons say that the quietness of the electric vehicles can be dangerous (e.g. pedestrians do not hear them).

3.1.2.3. Social

Half of the employees have stopped using a car to travel to/from work because they can use public transport to go to the city centre. However, those workers that still operate from the Bercy platform continue to use a car for their journey to work. The working timetable, the distances covered, the quality of working condition are better regarding others centres. A survey of 300 customers (quality of service, parking space, actions by the Paris city, what is important?) shows that the current organisation is good. The salary and wage costs represent 60% of total operating costs.

3.1.3. Phase 2. What score is achieved for the evaluation?

We introduce the data collected for this experiment, with its note (score) (1, 2 or 3) in the global calculation table realised from 15 French experiments as previously described (see Table 4):

- The first column presents the whole variables which have been selected by experts for the whole experiments. If a variable is without note, either it has been taken into account (but it would be better if it would be) or it was not useful for this type of experiment. In this case the square is grey tinted;
- The second column is the sum of notes allocated to the variable (0 if the variable is not informed),
- The third column is the occurrence for a note >2,
- The fourth column is the average note, the sum of score/occurrence on line,
- The fifth column presents the importance attributed to each variable for the Chronopost experiment in the framework of constructing the table. If the variable has been judged without object, the square is grey, and
- The last column is the attributed note for each variable concerning the Chronopost evaluation

The global note (score) is about 62.

3.2. The Bristol case

In Bristol a UCC started up in May 2004. The UCC was designed to serve the Broadmead shopping area a major retail location in the centre of Bristol. Broadmead contains over 300 retail and other commercial establishments and further development is expected to increase this by 40%. The UCC is located on an established industrial estate on the north western edge of Bristol, close to both the motorway network M4 and M5 motorways. It is approximately 16 kms from Broadmead with a typical journey time of 25 minutes. The main aims of the scheme are to reduce congestion and pollution in Bristol, with the following more specific objectives:

- Reduce the number of delivery vehicles in the area served by the UCC,
- Assist with improving air quality,
- Ameliorate conflicts between vehicles in unloading areas and delivery bays,
- Reduce conflicts between delivery vehicles and other road users, including pedestrians,
- Improve the delivery service provided to retailers, and
- Give the opportunity for added-value services to retailers (e.g. packaging collection and remote stock storage).

The use of the UCC by retailers is voluntary. At the start of the project the use of the UCC was free to the retailers with the costs met from the City Council. Over time the retailers have been expected to meet a growing proportion of the costs. There is no publicly available comprehensive evaluation report. However, there have been many presentations and discussions about the UCC and these have been used to carry out an evaluation based on a 12 month period during 2007/2008 and comparing the ex-post and ex-ante situations. The UCC is operated by DHL and supported by Bristol City Council.

The previous organisation: Before the UCC was established survey results indicated that the retailers within the Broadmead area received 100,000 deliveries a year (i.e. about 300 deliveries per retailer per year). The delivery operations were carried out by a wide range of companies including both third party and own-account operations. The types of goods delivered were very varied and a wide range of vehicle types and sizes were used to serve the Broadmead. Some deliveries came from a long distance while others arose from more local points. In the period being evaluated 64 retail outlets used the UCC to manage their deliveries. This amounts to about 20% of all retail outlets in the Broadmead area. The evaluation and comparison is based on changes in the delivery requirements of these 64 retailers.

Current organisation: The UCC covers approximately 500 sq.m. and uses two vehicles for deliveries, a 7.5 tonne and an 18 tonne. A 9 tonne electric vehicle is being trialled and according to a recent case study is felt to be a success. Retailers involved in the project request their suppliers to deliver consignments to the UCC. DHL then receive the consignments and organise the delivery to the retail store in Broadmead. There have been no reports of transport companies resisting this change. For some companies that have to deliver to Bristol there will be travel savings because they now only need to go to the edge of the city centre whereas before they had to go to Broadmead itself. There are no figures for the number of transport companies that have had to change their operating patterns. An initial survey established that the focus should be on flows of non-perishable and not very high value goods for medium-sized retailers. As noted in 2007/2008, 64 retailers were served by the UCC.

3.2.1. Phase 1. What data were observed?

3.2.1.1. Economic results

- Delivery vehicle trips to the 64 retailers fell from 9260 trips per year to 2315 trips per year (a reduction of 75%),
- The distance covered decreased from 237333 kms per year to 59333 kms per year,
- A total of 330 roll cages of products were delivered to the retailers each week (17,500 roll cages per year),
- The available data suggests that an average of 7-10 roll cages per trip are carried on the delivery vehicles,
- In a typical week each of the two vehicles based at the UCC vehicle makes 3 or 4 trips/day from the UCC to Broadmead returning with packaging and empty roll cages,
- The reduction in vehicles trips to Broadmead has resulted in more efficient use of the loading spaces within the city but no estimate is available of the impact of this on traffic conditions,
- Total costs of the UCC 459,000 £ (2007/2008) (approximately 350000 € at ROE in early 2008),
- Income from retailers using the UCC 174,000 £ (134000 €)
- Public subsidy 2007/2008: 216000 € (planned to reduce this to 175000 € in 2008/2009),
- No information is available about maintenance of the vehicles,
- Changes in travel patterns of the delivery persons are not known. The comparison is not the same as the Chronopost experiment because prior to the UCC deliveries were made by a wide range of companies that the main difference is the change in delivery trips. There is no reason to assume any change in the private travel patterns of the deliverymen/drivers;
- Given the reduction in the number of delivery trips there will be some saving in the total time to make the deliveries although because the vehicles from the UCC contain consolidated loads the individual time for delivery per trip will have risen.

3.2.1.2. Environmental effects

Estimates have been made of the CO2 and other emissions savings based on the reduction in vehicle kms. These savings for a 12 month period in 2007/2008 are:

- 89 tonnes of CO2, 870 kgs NOx and 25 kgs PM_{10},
- 14 tonnes of cardboard and 3 tonnes of plastic recycled (returned by the city centre retailers), and
- No details of the acoustic emissions but the vehicles used are Euro 4. Specification and drivers are SAFED trained which means they have received training in safe and fuel efficient driving techniques.

3.2.1.3. Social

The following qualitative points can be made:

- The jobs at the UCC are new jobs but it can be argued that some transport services to deliver from outside Bristol to the city centre are no longer needed so the effect on employment may be to reduce the demand for drivers (deliverymen);
- Working conditions for the staff employed at the retail outlet have been improved, they have more certainty for the delivery time and can schedule this at a time when the store is not so busy with customers. The centre of Bristol is a safer environment because there are fewer heavy goods vehicle trips and kms. The delivery persons from the UCC are very familiar with the delivery area so they are able to operate more safely and efficiently;
- Customers (the retailers) are very satisfied with the UCC operation, surveys report that over 90% are completely satisfied with its operation; and
- The number of retailers using the UCC operation has grown each year since the implementation of the pilot project in 2004.

3.2.2. Phase 2. What score is achieved for the evaluation?

The variables observed in Bristol experiment have been put into the table, that permits the attribution of a score (see Table 4). Based on the comparisons of the evaluation scores shown in Table 4 it is clear that the evaluation carried out for the Chronopost project considered a greater range of indicators than in the case of Bristol and that these indicators provide a more detailed picture of the results of the project. One outcome of the exercise above is that for further follow-up evaluations of Bristol we can state that it would be important to quantify the missing elements in order to allow a more comprehensive evaluation.

4. Conclusion

The methodology enables a standard approach to be adopted in order to understand the quality of the evaluation that has been made of a particular project or innovation concerned with urban logistics. The robustness of the methodological approach has been tested and demonstrated by considering whether re-scoring with the attribution of the notes changes the importance of any of the variables. In the research it was found that this did not change the relative importance of the variables and that it was therefore possible to identify a consistent set of core variables that need to be used within an evaluation exercise.

The approach proposed in the paper also enables the evaluation of a project to take place at the planning and feasibility stage (i.e. before implementation). Using this approach the project promoter can identify the important variables that need to be considered. For the public sector this is a potentially valuable tool that can be used to help determine the extent to which public support may be necessary and desirable for a given project or innovation. The approach can also help by formalising the extent to which there may be a risk to the success of the project if some of the expectations are not achieved. By applying a sensitivity test for example, it would be possible to explore the impacts on the different variables and thus on the outcome of the project, in a consistent and comprehensive way.

We appreciate that the decision-makers and politicians do not always require the level of detail inherent in the approach discussed. Often their goal is to resolve a local problem (e.g. congestion, pollution or road sharing) and only the outcome is of significance. However, the role of the researcher is to establish the conditions that will enable experiments and projects to be extended and that provide insight into the transferability of different solutions. This is an aspect that is being addressed within the EU project SUGAR where existing experiments are being evaluated in order to determine the scope for implementation in other cities that need to improve urban goods movements (SUGAR, 2009).

The use of this methodology also allows an element of ranking to be applied in a consistent way for projects that are proposed or for the decision about the continuation and further developments of a project or innovation. Based on the analysis presented in this paper we can see that there are no overwhelming reasons why this approach cannot be adopted in different countries and also used to make international comparisons. We hope to have the opportunity to do the same exercise with other countries in a different context (for example a country in North or South America or Asia). The key point is the need for as much detailed data as possible to be made available in relation to projects in the field of urban goods and city logistics. The number and diversity of the variables that can be

Table 4 Application for French and UK experiments

VARIABLES	sum of scores	occurrences on ligne	occurrences > 2	note	Chronopost Concorde	Chronopost Note	Bristol Note
SOCIAL							
(Q) working conditions	14	9	4	1,6	2	1,6	1,6
number of deliverymen/employees	12	6	4	2,0	2	2,0	2,0
(Q) training, integration	11	6	3	1,8	1	1,8	
(Q) subcontracting (previous contracts)	7	4	3	1,8	1	1,8	
journey time for employees	3	2	1	1,5	2	1,5	
(Q) fonction evolution	1	1	0	1,0			
...equitable...							
subsidiaries/repayable advances,	28	10	10	2,8	3	2,8	2,8
investments costs	26	11	9	2,4	3	2,4	2,4
Functionning costs	25	12	8	2,1	2	2,1	2,1
number of parcels	21	8	8	2,6	3	2,6	2,6
visibility of the firm	20	10	9	2,0	1	2,0	
costs of services	20	9	7	2,2			
(Q) customers and users satisfaction	19	9	8	2,1	1	2,1	2,1
number of customers	18	9	7	2,0			2,0
number of positions	16	7	6	2,3	2	2,3	2,3
(Q) safety	13	6	5	2,2		2,2	2,2
(Q) typology of aimed activities	12	5	5	2,4		2,4	2,4
(Q) customers motivations	11	5	4	2,2			2,2
(Q) typology of concerned goods	10	5	4	2,0		2	2,0
evolution of the turnover, benefit	10	7	2	1,4			
Wage bill/turnover	9	4	3	2,3			
number of palletts	8	5	2	1,6			1,6
frequency of deliveries/stop	3	1	1	3,0			
(Q) seasonal variations	3	2	1	1,5	1		
share of annex prestations/turnover	3	1	1	3,0			
number of billed hours	1	1	0	1,0			
ECONOMICAL							
capacity of vehicles	21	9	8	2,3	3	2,3	2,3
number of rounds	16	7	7	2,3	3	2,3	2,3
% Urban Logistic Space utilisation	14	6	6	2,3	3	2,3	
lenght of the rounds	10	4	4	2,5			
delivery time / JIT	11	4	4	2,8	2	2,8	
time for loading/unloading	9	4	4	2,3			2,3
size of premises	6	5	1	1,2	2	1,2	
number of unsused vehicles (in reserve)	4	3	1	1,3	1	1,3	
moving time of vehicles	2	1	1	2,0			
number of customers	2	1	1	2,0			2,0
parcels return rate	1	1	0	1,0			1,0
...viable...							
distance PF-point to be delivered	23	10	9	2,3	3	2,3	2,3
energy consumption	18	9	9	2,0	2	2,0	2,0
number of vehicles based on the platform	12	6	6	2,0	2	2	2,0
number of vehicles on each link	10	5	5	2,0	2	2	
filling rate of vehicles	7	4	3	1,8			
speed	6	3	3	2,0			
runing rate of the vehicles	4	2	1	2,0			
empty return rate	2	1	1	2,0			
wairing of vehicles	2	2	0	1,0	1	1,0	
handling weight/delivered weight	1	1	0	1,0			
ENVIRONNEMENTAL							
distances by road (km, veh.km)	26	10	10	2,6	3	2,6	2,6
pollutant emissions	22	11	9	2,0	2	2,0	2,0
share of deliveries by clean vehicles	20	7	7	2,9	3	2,9	2,9
timetable on the platform	12	6	5	2,0	1	2	
noise	12	6	5	2,0	1	2,0	
visual impact	4	3	1	1,3	1	1,3	
...bearable...							
authorised/ non authorised deliveries	19	8	8	2,4			
duration of stops	16	7	7	2,3			2,3
road congestion	15	6	6	2,5			2,5
in the way Parking time	13	6	6	2,2			
timetable to stop for delivering	7	4	2	1,8			1,8
conflicts between space occupancy mode	6	2	2	3,0			
working timetable	6	4	1	1,5	1	1,5	
(Q) safety	6	5	1	1,2	1	1,2	
mode of transport for deliverymen	5	2	2	2,5	2	2,5	
(Q) infrastructure size/ present vehicles	4	2	1	2,0			
(Q)goods handling	4	2	2	2,0			
last mile on foot	4	2	2	2,0	2	2	
Global note				130,8		73	60,6
(1) Global note requiered in the evaluation of experiments						113,83	128,8
Score (1)/(2)						0,64	0,5
useful for savings calculation		not found in the text					
without object in this experiment							

considered means that the approach can be applied to many types of projects or innovations. In this paper we have compared two rather different projects. Future research can develop this theme by making wider comparisons across projects. In addition, in the future, we hope to be able to include assessments of the impact on the total traffic levels within the city and to create links with models used for this.

There are several ways in which the approach discussed above needs to be further developed. One aspect concerns the extent to which the ratios in successful cases in different situations fall into a very narrow range. As yet the comparison between experiments and projects is not sufficiently extensive to determine the answer to this. What can be said is that by applying the approach in a consistent way it will be possible over time to build up a database of projects and evaluations and thereby answer this question.

In preparing the paper we have tried to identify other reviews of evaluation approaches in the field of urban goods movement. As stated in the early section of the paper, there are many projects now available for analysis and potentially many evaluations (although many of those published lack sufficient detail). However, we have not been able to identify a comprehensive assessment of the evaluation approaches that have been applied in this field. Thus we hope that this paper has demonstrated a potentially valuable tool for those wishing to implement projects in the urban goods field, for decision-makers who may be required to consider policy interventions and for researchers who may be consulted as part of the development of projects and innovations

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