



vrije Universiteit amsterdam

Faculty of Exact Sciences

BMI Internship Report

**Parking at Amsterdam RAI
- Towards a new future -**

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Preface

The end of the Business Informatics and Mathematics (BMI) Master program consists of an internship that has to be carried out within a business, industry or research facility outside the Faculty of Exact Sciences of the VU for a period of six months. This report contains the results of my internship at the Parking department of Amsterdam RAI Convention Centre.

First, I would like to thank my supervisors Niseth van der Meulen (Amsterdam RAI) and prof. dr. Rob van der Mei (VU University) for offering me the opportunity for this internship. Their enthusiasm, feedback and believe was a great motivation during the internship.

Secondly, I would like to thank my second reader Alwin Haensel (VU University) who, together with Rob van der Mei, provided me with useful feedback on this report.

Furthermore, I would like to thank my colleagues from the Parking department for giving me a warm welcome and a very pleasant time during the past six months. They not only taught me a lot about all the operational processes, but were also very kind to work with.

Finally, I would like to thank all other RAI colleagues and suppliers that provided me with a lot of useful information during interviews and other forms of contact. In particular, I wish to mention Frank Hulsen who formed a bridge between me and the ICT department in his role as business analyst.

Robert van der Mast

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Executive summary

The Parking department of Amsterdam RAI is responsible for all logistic flows around the building over the course of events and during the construction and dismantling. The main question for the department is: *How can we enable a smooth, effective and efficient logistic transport and parking process?* To answer this question we searched for bottlenecks that are disturbing the process. Besides we explored Revenue Management techniques that could help the Parking department in maximizing the sales of parking tickets.

The most important bottlenecks that we found are data which is spread over several sources, the fact that analyses are hard to perform, a decreasing parking capacity, no possibility for flexible parking rates due to technical restrictions and the lack of possibilities for real-time traffic statistics.

Our approach in finding solutions was a collection of different actions:

- 1) Interviews with colleagues and suppliers.
- 2) Company visits to similar companies.
- 3) Walking along with the traffic controllers.
- 4) Developing a Parking Planning Tool in Excel.

The resulting Parking Planning Tool will be very valuable during the daily work at the Parking department. Besides developing this tool, we also worked on preparations for a “clean terrain”-policy at the RAI with help of a new approach for Lorry parking. Finally, we also took part in fortnightly discussion sessions about a new parking system (for inside the parking garages).

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1. Introduction

1.1 Amsterdam RAI

Amsterdam RAI, or RAI for short, is a complex of conference and exhibition halls located in the capital of the Netherlands. With 11 interconnected halls and 25 conference rooms on a total of 87,000 square meters of exhibition space, Amsterdam RAI is one of the biggest exhibition centers of the Netherlands. Each year more than two million visitors are welcomed on one of the events. To accommodate all this visitors the RAI has underground parking space for about 3,000 cars and another 3,000 parking lots at external parking terrains near the RAI.

The Parking department of Amsterdam RAI is responsible for all logistic flows around the building over the course of events and during the construction and dismantling. A smooth, effective and efficient logistic transport and parking process is an important satisfier to all customers such as exhibition organizers, exhibitors and visitors as well as own and hired staff, suppliers, press and various other users of the RAI. How to enable such a process is the main question for the Parking department.

1.2 Internship goals

To answer this question we will first try to identify bottlenecks that have a negative impact on the process. After the most important bottlenecks are identified, we will search for solutions to remove or decrease the negative impact of them. Most of these bottlenecks were handed to us right at the beginning of our internship and were used to define concrete deliverables.

To clarify how the various deliverables were defined, the next paragraphs contain short descriptions of the most important bottlenecks and the related deliverables. The bottlenecks are further elaborated in the next chapter.

Currently, making operational plans (for staff, use of terrains and other resources) requires a lot of manual searching because the required data is spread over various sources. If the planning needs to be adapted during the realization of the event the same ineffective cycle is repeated. The result is that planning is inefficient and mistakes are easily made. With (semi-)automated data gathering at a central location, the data can be retrieved faster and in a more accessible way, which leads to an improved and far more efficient planning process.

Furthermore, the software that currently is in use by the Parking department is unable to provide financial insight on a daily basis, which makes it almost impossible to quickly intervene when desired. To get this insight a tool needs to be developed which offers the possibility to generate reports with certain key figures and ratios. This tool should also be used as central location for data storage.

Finally, the Parking department wants to increase utilization of the parking garages by using flexible parking rates alongside the fixed daily rate. It is essential that the existing infrastructure is replaced to achieve this. This infrastructure replacement will entail considerable costs. Through the establishment of a business case it will become clear whether this investment is justified.

Summarized: the main goal of this internship is the development of a planning tool, which should lead to lower operational costs through more and better insight in the differences between planning and realization (on a daily basis). Besides, the use of the developed tool should result in a reduction of work time for the head of operations during planning an event through improved and easier operational planning.

The following deliverables should be the result of the internship:

- Data collection & presentation:

Excel tool with input and output functionality, according to the data model and functional description (see attachment)

Documentation of the tool to support further maintenance by the Parking and ICT departments after finishing the internship

- Optimization of operational processes:

Report with recommendations

- Business case Flexible parking rates

Assistance with calculations and forecasts (based on RM principles)

With help of these deliverables the Parking department should be able to make a big step forward in enabling a smooth, effective and efficient logistic transport and parking process.

1.3 Structure of this report

This internship report starts in Chapter 2 with some facts and figures of the current situation at the Parking department combined with a problem statement. What follows in Chapter 3 is a description of the approach that we used to create improvements and solutions for those bottlenecks. Those solutions are described in Chapter 4. The report ends with a conclusion and recommendations for future work in Chapter 5.

Finally, a bibliography and some appendices are included as background information.

Due to the fact that this internship was really practical oriented and targeted at the delivery of a working software tool, we decided to keep this report brief and concise. The reader should not expect profound theoretical treatises, but more a report of all the activities and work that we carried out during this internship.

2. Current situation and problem statement

This chapter starts with a general introduction of the Parking department. We will continue with a problem statement consisting out of five bottlenecks that were found to be important negative factors during our research. Each section deals with one of these bottlenecks. Later in this report for each bottleneck one or more possible solutions are presented.

2.1 Current situation

The Parking department is part of the Convention Centre division and has nine full-time working employees. These full-time employees are working as manager, office manager, head of operations, technical supervisor or general assistant. Besides this full-time staff the department uses a lot of temporary staff for operational work like traffic guidance on the parking lots.

Due to the nature of exhibitions and conventions there are many days in a year that only require a small operational staff because the RAI is not completely rented out during the whole year. Those quiet days are alternated with very busy days before, during and after exhibitions that require an operational staff of up to thirty people.

Visitors and exhibitors that want to park their car can buy a ticket that is valid for one day. This rate is fixed at € 15.- during regular days, and is sometimes raised to € 20.- for the internal parking garages during very large exhibitions. At those days it is still possible to park your car for the regular rate of € 15.-, but only at external terrains that require a bus shuttle to and from the RAI.

Besides the income from visitor car parking, the department generates income from trucks and lorries that want to park during an event. In general these lorries bring goods at the build up phase of the event, and take these goods back to home after the event has finished during the dismantling phase. This type of parking is known as “Lorry Parking”.

One latest source of income to be mentioned are parking subscriptions that can be bought by everyone that wants to park his car for a longer time in one the RAI garages. Normally these are people that are living in the direct neighbourhood.

The annual turnover sums up to about 4 million Euros (2009). About one third of this turnover consists of direct costs and another one third are indirect costs like salary costs of the full-time staff, office costs and all other costs that cannot be assigned directly to a specific event or day.

The use of temporary staff is an important cost driver for the Parking department. It is therefore important that the planning of this temporary staff is done carefully. To be able to make a good planning for the operational staff, one needs a proper estimation of the expected amount of cars and the terrains that will or might be used. As you can read in the next chapter this is one of the hardest parts of the work at the Parking department.

2.2 Data is largely spread

Currently, all data is largely spread over different sources, like various Excel sheets, Word documents and some software like Interflex (used for staff planning). When one wants to make a logistic planning of the expected traffic for an event, one has to gather all this data manually from those different sources.

To give a short impression of such sources we list some of them below:

- Day reports of the previous edition
- Capacity planning (with the expected number of cars)
- Staff planning of the previous edition
- Parking sheet (number of drive-through cards for the loading areas)
- Discussion report (opening hours, number of stands, percentage international visitors)
- Post show document (evaluation of the previous edition)
- Traffic plan of the current and previous edition (parking areas to be used)
- Traffic plan and discussion report of any simultaneous events

All these documents have to be gathered from different folders at the network storage. This is not only very time consuming, but also error prone due to the fact that many of the documents are stored in multiple versions.

2.3 Analyses are hard to perform

Currently, there is no central data collection system where all relevant information is stored. Such a system would be ideal as data source for a management dashboard that can be used to perform analyses and calculation of default ratios, like the number of parked cars compared to the number of (flexible) staff at a certain day.

If someone would like to make such an analysis at this moment, all data gathering and calculations have to be done manually. This requires a lot of time and leaves room for mistakes.

2.4 Parking capacity is decreasing

Over the few decades, there has been a lot of urban development in the neighborhood of the RAI. Especially the growth of the Zuidas area has a big negative influence on availability of terrains that can be used by the RAI for parking. This area contained a lot of undeveloped land lots for future office building which could be used by the RAI as extra parking capacity for large events. These terrains have recently been populated with large office complexes, making them unusable for parking purposes [Zuidas 2010]

Another space consuming development is the construction of the North-South line, a metro line that will run from Amsterdam North to Amsterdam South. This metro line includes a station at the Europaplein, right in front of the RAI. To enable the metro route, the RAI had to give up 30 lots in the

parking garage permanently and about 350 car and 28 bus parking lots temporarily for a period of almost ten years [Noord/Zuidlijn 2010].

Besides these external developments, the RAI decided to expand with a new building called RAI Elicium. This new multi-functional building, which was opened in September 2009, also took some space on the RAI site that could be used for car parking before.

2.5 Flexible parking rates are not supported

Due to technical limitations of the current system that is installed in the parking garages it is not possible to use different parking rates at the same time. The system uses tickets that are valid for a whole day and are sold at a fixed rate. It is possible to change this rate manually, which is done at certain large fairs like the Huishoudbeurs, but there can only be one rate at a time.

This system is good for visitors of a fair or other event that lasts for (almost) a whole day. However, if one visits a theatre performance that only takes two hours the costs for parking your car are fairly high, especially when one calculates the price per hour. So, a more flexible system is desirable and would be more customer friendly.

The fact that the current system has this limitation also led to a change in the objectives of the internship. Originally, we would focus on revenue management by means of flexible rates for different customer segments which is common practice in airline and hotel industry. Recently these price differentiation techniques have also been applied at one of world's largest parking companies (Park 'N Fly, United States¹) leading to a significant increase in both turnover and profit [Soomer 2009] and [Mei 2009]. Therefore we wanted to try to apply such techniques at Amsterdam RAI, but this turned out to be impossible with the current system. In consultation with both supervisors we agreed to change the objective of the internship to a more practical alternative, which is already described in the Introduction (Chapter 1.2).

2.6 Real-time traffic statistics are not available

During busy days possibly the biggest challenge for the head of operations is making the decision *if* and *which* external terrains should be opened. Because the use of external terrains is relatively expensive compared to the use of the internal terrains (see Chapter 7.4 for a map of these terrains), it is very important to use them only when really necessary.

For example, keeping the ArenA parking terrain (with a capacity of over 2,000 cars) stand-by costs at least € 3,000.- per day [Meulen 2009]. The break-even point for this terrain was 913 cars in 2009.

There are only a few days that have an expected number of cars that is large enough to plan the use of such a large external terrain in advance. On all other days with a lot of traffic this decision has to be made during the day, based on both the expected total number of cars and the cars that are

¹ <http://www.pnf.com/>

already parked at one of the parking terrains. The latter one requires manual counting by the traffic controllers, because only the internal parking garages have a digital counting system. This digital counting system (manufactured by WPS Parking Systems²) is also not fully reliable due to the fact that it does not count availability on place level, but uses some counting loops in the garage roads that suffer from noise that is generated by service cars, bikes and cars that have not been parked properly and occupy two neighboring places.

The expected total number of cars on a day can be forecast based on historical data and the expected number of visitors. A problem is that this expected number of visitors can only be derived from the total number of visitors for the whole exhibition period. The responsible exhibition account teams are not able and/or willing to make a forecast on a daily basis, which is quite frustrating for the Parking department (and some other department as well).

² <http://www.wsparkingsolutions.com/>

3. Approach

To realize the project goals formulated in Chapter 1, the following stepwise approach was taken.

3.1 Interviews

The first thing we started with was having interviews with colleagues in- and outside the Parking department and with some suppliers. These interviews learned me a lot about the different processes at the Parking department and were a good introduction to our internship. They also pointed me at some bottlenecks that could be included in our research.

3.2 Company visits

To find solutions and improvements for the bottlenecks we decided to search for other companies that might have encountered the same problems, because it is better to learn from their experience than to reinvent the wheel. We managed to arrange visits with interviews to Messe Berlin (a large exhibition complex in Berlin), a regional distribution centre of Ahold/Albert Heijn (retail goods) and FloraHolland Aalsmeer (flower auction centre).

Those visits were very informative and delivered a lot of new ideas, from which some could be very interesting for the RAI. Below we listed the most interesting ideas for each of the three companies mentioned before.

3.2.1 Messe Berlin

The Messe Berlin is located inside the city of Berlin and is almost completely surrounded by other buildings and roads. Because of this there is only limited parking space for visitors and freight traffic. This is comparable to the current situation of Amsterdam RAI.



To be able to keep the loading areas as clean as possible each driver who wants to access the terrain of the Messe has to pay a deposit of € 100.-. This deposit is returned if the driver leaves the terrain before the time limit has passed. Time limits depend on the size of the car or lorry and vary between 2 and 5 hours. Due to the amount of the deposit it is a very effective measure in controlling the traffic and making sure that almost everyone leaves within the time limits.

In the past the RAI has used a similar deposit policy years ago, but it was stopped after a while due to the fact that it led to huge amounts of cash money carried by staff members, making them vulnerable for raids. If a usable alternative for cash money could be found, reintroducing the deposit policy could be very useful for the RAI.

Related to the deposit policy is the rule that in the first hour after an exhibition closes, which is usually at 18:00pm, only logistic partners of the Messe may enter the terrain to clean the halls by

removing empty packings (“emballage”) and carpets. After one hour lorries can enter the terrain to load the retour freight. Another hour later all other vehicles are allowed to enter the terrain.

Access is granted on a “first come first serve” basis. The main advantage of this policy is that the terrain is almost empty during the day. This allows other traffic (like crew vehicles) to work without problems.

A drawback is that all traffic has to wait at public roads before they can enter the terrain. At the last day of an exhibition congestion will occur caused by lorries and cars that have to wait to 19:00pm or 20:00pm. Sometimes the police intervenes and orders all drivers to drive away so that they have to drive around and reenter the waiting queue at the back. Of course drivers that have been waiting for some time are not happy with such interventions.

Another nice concept is traffic regulation with loudspeakers mounted on cars. The reason to do it this way is to prevent discussions with the traffic controllers. If the traffic controller is sitting in a car, he is much less approached by drivers than when he is standing outside on the road.

Exhibitors or stand builders that want to use a forklift have to rent them from one of the permanent logistic partners of the Messe. Own forklifts can only be used after an inspection and payment of € 800.- per day. Because of the high costs the use of own forklifts is very seldom. This policy is very handy to control traffic inside the halls in contrast with the RAI where almost every forklift may access the halls during build up and dismantling of an exhibition.

3.2.2 Ahold Regional Distribution center Zaandam

Ahold, known of the Albert Heijn supermarkets, has two nationwide distribution centers (DCs) and four regional DCs. The regional DC in Zaandam that we visited uses time slots with a length of one hour. Each supplier gets one or more slots, based on the number of times that he delivers goods at the DC.



Very strict enforcement of these slot times does not work, so some flexibility is required. For example large suppliers like Heineken (beer manufacturer) are mainly interested in low cost delivery for themselves and not in the most optimal receiving of goods by the DC. Therefore discussing this with the suppliers is very important.

3.2.3 FloraHolland Aalsmeer

The building of FloraHolland Aalsmeer measures over 1 million square meters which, according to the Guinness Book of Records, makes it the largest commercial building in the world. A large part of the roof is used for parking, with a capacity of several thousand cars.



Roof parking would be very interesting for the RAI, but unfortunately the buildings are technically not suited to do this. When the halls were built, parking space was widely available and therefore there was no need for expensive architectural improvements that would enable roof parking.

The flower auction also uses a time slot system, which is rather strict enforced by financial penalties. Every truck that arrives needs to be unloaded which is done by crews of FloraHolland. Planning the work of these people requires real-time insight in incoming traffic.

About 70% of the time slots can be reserved in advance. The other 30% is used for ad-hoc traffic. When a driver enters the terrain he has to confirm his arrival by phone in exchange for the exact location where he can park his truck.

The time slot system is now in use for some years and has greatly improved traffic flows. Traffic jams and long waiting times are now very rare. An important lesson learned is to take into account a transition period of at least one year. After one year almost everyone that visits the complex knows the system and in most cases also sees the advantages.

3.3 Walking along

Another way of getting acquainted with the work of the Parking department was by walking along with colleagues at the workplace and simply observing what everyone was doing and how all traffic was handled. Especially large fairs like the Huishoudbeurs (household fair) where external parking terrains with bus shuttle services are used were instructive. Doing this was important to stay in touch with the daily practice and not getting caught in theoretical models that might not perform in practice.

3.4 Developing Excel tool

After selecting the most important bottlenecks and discussing the internship goals, preparing and developing the Excel based Parking Planning Tool became the most important part of our work. During the preparation many discussions took place with our colleagues from the Parking department to decide how the tool should work and which data should be included. These consultation sessions resulted in a data model and a functional description of the tool to be developed. To enable the technical realization of the tool a central hosted database that could function as data storage for the tool was installed.

4. Solutions

The approach we used led to some solutions for the bottlenecks that were mentioned in Chapter 2. This chapter contains these solutions, each presented in a separate section.

4.1 *Parking Planning Tool*

The most important solution, which is a great help in solving the “data spread” and “analyses are hard to perform”, is the developed Parking Planning Tool. This tool which is written in Excel VBA functions as a central data collector to provide management analyses and operational planning. The tool is connected with a MSSQL database for storing all inserted and updated data. There is no data which is stored directly in the Excel worksheet to enable multiple users without versioning problems.

The appendix contains sections with screenshots of the tool and a functional description which was made before the start of development. These screenshots provide a good overview of the different parts of the tool and its functionality.

The basic idea behind the tool is to store all data at a central location and provide insight in this data for every Parking department staff member. The tool replaces several Excel worksheets which are used to save certain statistics (like the car count list) or to make capacity plannings. By incorporating those worksheets into the tool and storing the data inside those sheets at the central database, time is saved (manual searching on the network share for the document is not necessary anymore) and multiple users can use the tool at the same time without file locks and read-only problems.

The tool gives a suggestion for the amount of visitors to be expected, and derives the expected number of cars from this. If everything is entered in the tool a traffic and logistics plan can be generated with one button click. This traffic plan contains basic information about the event, times and dates, terrains and halls that are used and so on. Inserted information can be retrieved later when planning a new event.

4.2 *“Clean terrain”-policy*

To make planning easier a completely clean and empty terrain around the RAI is desirable. However, completely empty will not be possible in practice. Therefore the Parking department should aim at making it as clean as possible under given circumstances like the amount of traffic.

The first step in attaining this is minimizing the amount of parked lorries that stay parked for multiple days, mainly during an event. Every lorry that is parked during an event takes about 2-3 places where regular cars could have parked. Besides the fact that parked lorries take potential car parking places, they also take a lot of handling and controlling which has to be done by traffic controllers that normally are assigned to other tasks.

Outsourcing lorry parking to an external provider would have the advantages of keeping the own terrains clean from lorries and minimize the use of traffic controllers for handling lorry parking

customers. The RAI would then get a commission fee for each lorry that parks at the (external) lorry parking location. An example of such a location is the Port of Amsterdam, where some companies do have large parking or storage areas that could be used for lorry parking during events. This change was described by me in the memo Lorry Parking policy change (Chapter 7.3), which has been sent to the operational director and some other departments.

Another solution in keeping the loading and unloading terrains (work terraces) clean is the use of time slots, which we saw applied at some of the companies described in Chapter 3. Introduction of a time slot system will surely need an amount of time to get everyone used to it, but when it is rolled out properly; almost every driver will see and experience the advantages of reserving a certain slot in advance and making sure to be there in time. If you are registered and on time you may immediately drive to your reserved dock area. However, if you are too late, you will be put into a waiting queue that is assigned to a small percentage of (unreserved) docks. Drivers that leave their parking spot too late can then be traced and penalized for exceeding the maximum dock time.

4.3 Business case new parking system

The current parking system at the parking garages is functionally too limited as we already mentioned earlier in this report. Besides those limitations it is also old (over 10 years since last upgrade and based on a list of requirements from 22 years ago) and already amortized. Therefore the Parking department is looking for a new system that will have extra value through better hardware and software. To decide if a system is good and fits the demands of the RAI we have been working on a list of functional demands that act as minimum requirements for a new parking system.

The most important wishes are listed below:

- License plate recognition.
- Possibility for flexible rates to be able to offer different tariffs for different customer groups.
- Real-time statistics of the occupancy at place level, needed for planning and operations.
- Better internal routing in the parking garages.



We assume that the importance of flexible rates and real-time statistics are described clear enough earlier in this report. License plate recognition is important to offer better service to customers, because they can reserve a parking place in advance. They will be accessible if the recognition cameras recognize your license plate that has been entered while making the booking.

Better internal routing is related to occupancy statistics on place level. If every place is equipped with a sensor and an indication light (red/green) you can easily generate real-time statistics of the amount of occupied places. Another advantage is that you can direct cars directly to an empty place inside the garage and non-occupied places are better visible when one is searching for a free place.



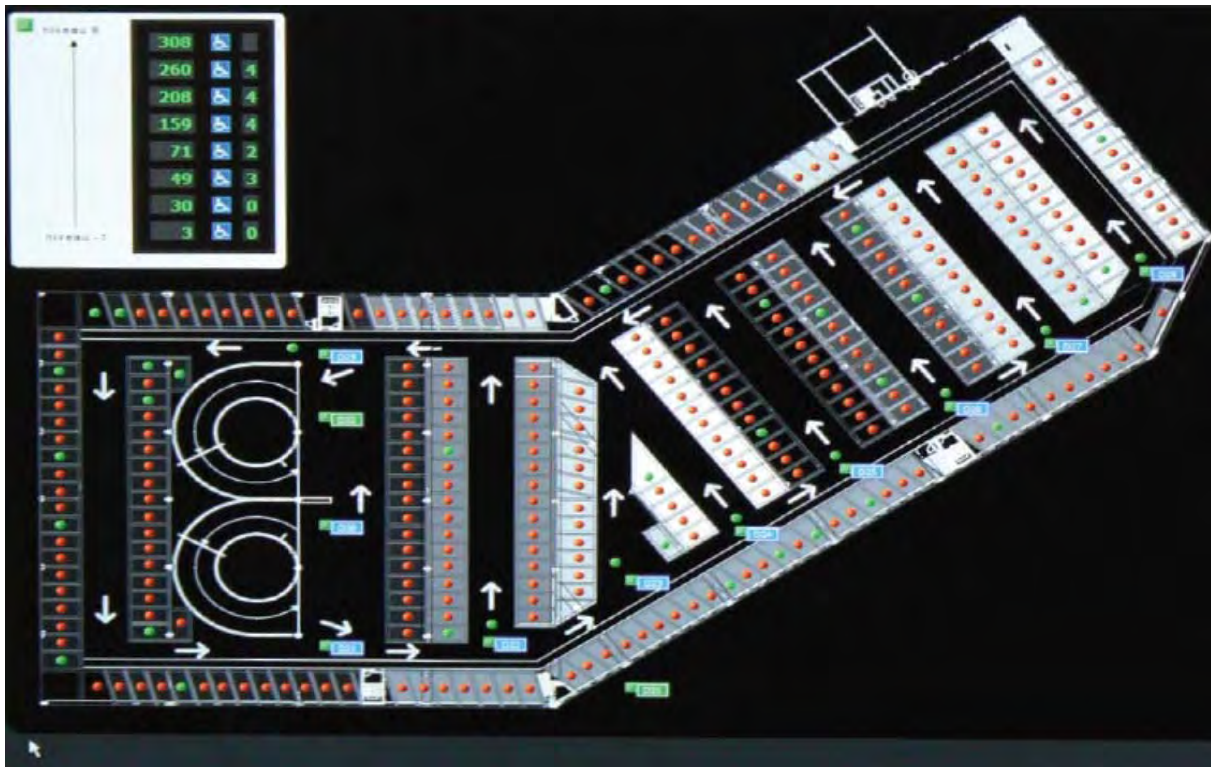


Figure 1: Digital overview of garage occupancy at place level (© Siemens Traffic)

4.4 General improvements

During our interviews with different colleagues and suppliers we collected some advices that can be used to improve processes and work at the department and cut costs.

The number of visitors is very important when making a forecast or planning of the expected amount of traffic. The exhibition team (Account Management), which is responsible for a certain event should be consulted by phone at the end of each day. If there are large fluctuations in the amount of visitors, it is necessary to check if there is an explanation for these fluctuations and probably modify the planning to fit the new expected number of visitors.

Shuttle busses are hired at days where external parking terrains are used. It happens often that there are differences between the planned hours that are ordered by the Parking department and the hours that are charged by the shuttle bus supplier (Oostenrijk B.V.). Many days have already passed if these differences are noticed when the invoice has arrived at the department, making it difficult to remember when busses arrived and leaved for their duty. To prevent unnecessary disagreements it would be wise to contact Oostenrijk B.V. after each day of shuttle bus use to ask them for the hour states of the day before. These hour states can be checked and confirmed with help of the responsible head of operations of that day.

5. Conclusion and recommendations

During this internship several bottlenecks were identified and studied. For most of them a solution exists as stated in the previous chapter. The Parking Planning Tool is the most prominent solution and provides a good starting point for further professionalization of the Parking department. Central data gathering and easy data retrieval are very important in providing an efficient workflow and are incorporated in the Parking Planning Tool.

Further improvements can be expected when a new parking system is purchased and brought into use. This will not only offer improved customer service but also statistics of higher quality and thus enable better planning.

A new parking system would also offer more possibilities for the application and implementation of Revenue Management techniques and models. When applied correctly, which requires improved data gathering and accessibility, they can have a significant positive impact on the sales and profit of the Parking department.

Because software is never complete, we have several suggestions for future extensions and research.

One important part of traffic planning is freight traffic that visits the RAI during the build up and dismantling of an event. This is a special type of traffic that needs further specific research to be able to develop a model that fits to this traffic. Some factors of relevance are the type of the event (public exhibition, professional fair, theatre or convention), the type and dimensions of stands including multi-storey stands, the percentage of shell scheme stands versus non-uniform stands and so on. This is all of influence on the amount of traffic that can be expected. To make it more tangible: if you have a fair with large objects (e.g. boats) that are transported with large trucks, you will have very different traffic compared to a fair with shell scheme stands and exhibitors that sell or display goods that are transported in regular passenger cars.

The Parking Planning Tool could be extended with various new options and improvements, which are listed in no particular order below:

- A direct connection with the parking system in the garage for real-time analyses and prognoses.
- Storing the day reports inside the tool, instead of the original Word documents on the network share.
- Setting the availability of halls and terrains for each individual event day instead of for the whole event.

- Inserting the number of issued drive-through cards for each terrain and each event day individually (instead of for the whole event only)
- Adding a new tab "Traffic plan" with all fields that are generated and the possibility to change them manually before generating the final Word document. This tab should also offer flexible text fields that can be inserted in a specific chapter of the document for optimal flexibility.
- Change the car count list (where the number of parked cars at a certain day are stored) by storing the total number of parked cars instead the number of cars at the moment of counting. This change requires a new system that can count every car enters a parking terrain.

6. Bibliography

[Mei 2009] R.D. van der Mei, K. Pak, M. Soomer and G.M. Koole, Revenue Management in the parking industry: new business opportunities, ERCIM News 78, July 2009, pp 25-26.

[Meulen 2009] N. van der Meulen and M. van de Weerd, Presentatie Product Management, Amsterdam RAI Parking, May 2009

[Noord/Zuidlijn 2010] Website Noord/Zuidlijn (North-South line) available at <http://www.noordzuidlijn.amsterdam.nl>. Consulted in August 2010

[Soomer 2009] M. Soomer, Revenue Management voor Airport Parking, STAtOR 2009-2, June 2009, pp 9-14

[Zuidas 2010] Website zuidas AMSTERDAM available at <http://www.zuidas.nl>. Consulted in August 2010.

7. Appendix

This appendix contains four sections. The first section shows different screenshots from the Parking Planning Tool. In the second section you can find the functional description that functioned as starting point for the development of the tool. The third section contains the data model that was used to design the database for the Parking Planning Tool. An internal memo about a change in the existing Lorry Parking policy has been included in the last section.

7.1 Screenshots of the Parking Planning Tool

This section contains some screenshots of the Parking Planning Tool to give you a general impression of how the tool that was developed during the internship looks like.

The tool can be used for planning an event and generating a complete traffic and logistics plan. Each event can be loaded from and saved to the central database. It performs several capacity calculations that previously had to be performed manually with different Excel worksheets. Those calculations are combined into one final advice about the use of terrains and traffic controllers.

For management purposes there is also an analysis page where cost analyses can easily be generated, based on some input variables like a start and end date, the aggregation level (analysis on daily, monthly or yearly basis) and restrictions on the terrains that should be included in the analysis.

For more information about the tool you can read Chapter 4.1.

Figure 2: The start screen of the tool with a lot of basic data

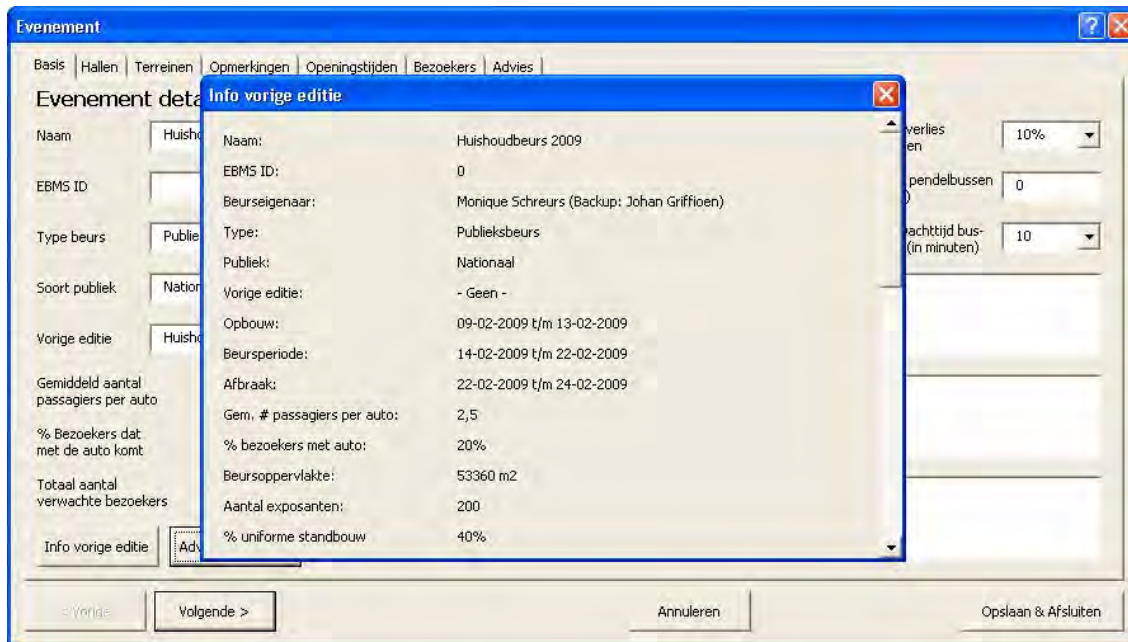


Figure 3: Overview of relevant details of the previous edition

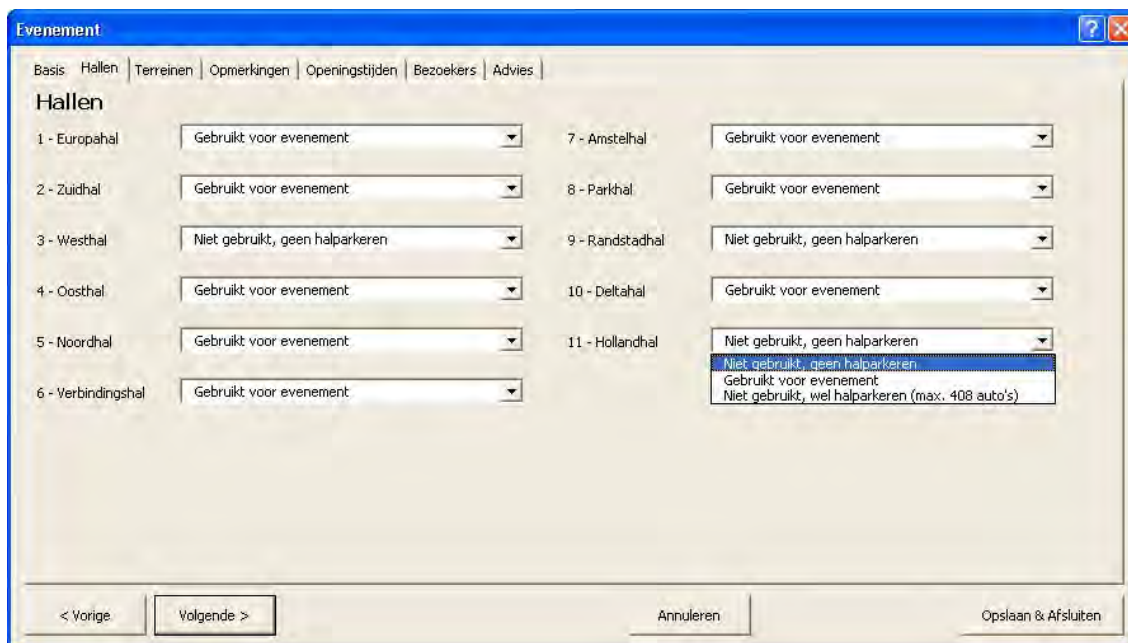


Figure 4: Inserting the halls that are used during the event

Evenement

Basis | Hallen | Terreinen | Opmerkingen | Openingstijden | Bezoekers | Advies

Terreinen

P1	Beschikbaar voor bezoekers (max. 660 auto's)	P15	Niet beschikbaar
P2	Niet beschikbaar	P16	Niet beschikbaar
P3	Beschikbaar voor bezoekers (max. 940 auto's)	P17	Niet beschikbaar
P4	Niet beschikbaar	P18	Niet beschikbaar
P5	Niet beschikbaar	ArenaA	Niet beschikbaar
P7	Niet beschikbaar	IBM	Niet beschikbaar
P8	Niet beschikbaar	IBM weekend	Niet beschikbaar
P9	Niet beschikbaar	ArenaA Towers	Niet beschikbaar
P10	Niet beschikbaar	Borchland	Niet beschikbaar

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Figure 5: Choosing which terrains are available

Evenement

Basis | Hallen | Terreinen | Opmerkingen | Openingstijden | Bezoekers | Advies

Opmerkingen & bijzonderheden

Lorry Parking	Er worden een aantal voertuigen voor lorry parking verwacht. Deze kunnen parkeren op P18.	Opbouw	
Schaduwlijsten	Bijhouden bij post A en post B	Beursperiode	
Vervroegde opbouw	Lijst via DM	Afbraak	

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Figure 6: Possibility to insert and change all kinds of remarks and notes

Evenement

Basis | Hallen | Terreinen | Opmerkingen | **Openingstijden** | Bezoekers | Advies

Openingstijden

Opbouw - 8-2-2010	07	:	00	t/m	22	:	00
Opbouw - 9-2-2010	07	:	00	t/m	22	:	00
Opbouw - 10-2-2010	07	:	00	t/m	22	:	00
Opbouw - 11-2-2010	07	:	00	t/m	22	:	00
Opbouw - 12-2-2010	07	:	00	t/m	22	:	00
Evenement - 13-2-2010	11	:	00	t/m	18	:	00
Evenement - 14-2-2010	11	:	00	t/m	18	:	00
Evenement - 15-2-2010	11	:	00	t/m	18	:	00
Evenement - 16-2-2010	11	:	00	t/m	18	:	00

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Figure 7: Choosing opening hours for each event day (used for staff and resource planning)



Figure 8: Approximation of visitor numbers on a daily basis

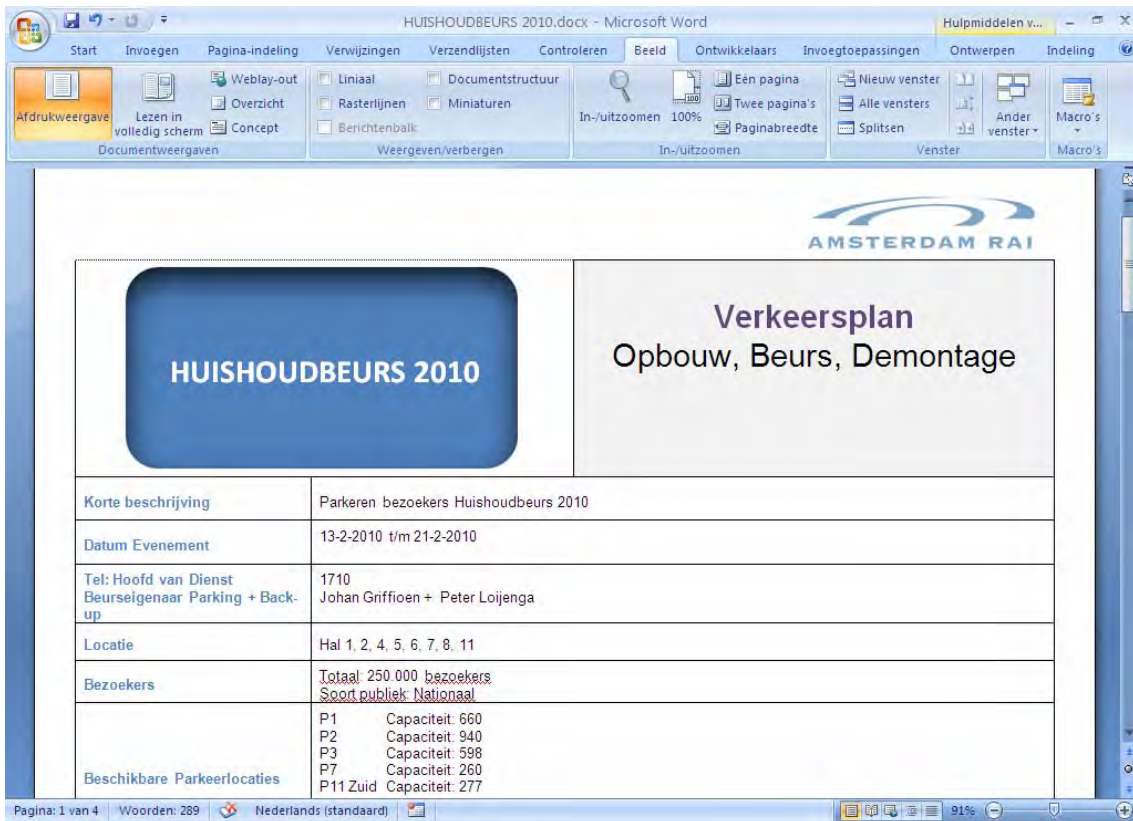


Figure 9: The final result, a traffic and logistics plan

The screenshot shows a Microsoft Excel spreadsheet titled "test_vba2z_comp.xlsx". The spreadsheet contains a table with the following columns: Datum, Planning uren, Realisatie uren, Verschil, Planning kosten, Realisatie kosten, and a dropdown menu for Aggregatie (Dag, Maand, Jaar). The data is as follows:

Datum	Planning uren	Realisatie uren	Verschil	Planning kosten	Realisatie kosten	Aggregatie
05-01-2010	18.50	15.25	-3.25	351.13	289.45	-61.69
06-01-2010	81.50	81.00	-0.50	1659.69	1652.41	-7.28
07-01-2010	97.50	98.25	0.75	1975.93	1992.77	16.84
08-01-2010	120.50	123.50	3.00	2410.75	2496.51	77.76
09-01-2010	74.00	59.50	-14.50	1436.71	1161.50	-275.21
10-01-2010	93.50	91.50	-2.00	1838.22	1797.90	-40.32
11-01-2010	335.50	327.25	-8.25	6741.66	6598.73	-142.93
12-01-2010	314.00	319.50	5.50	6321.61	6430.52	108.91
13-01-2010	338.00	337.25	-0.75	6777.13	6756.57	-20.56
14-01-2010	439.53	433.25	-6.28	8918.80	8825.61	-93.19
15-01-2010	116.50	100.50	-16.00	2343.53	2033.82	-309.71
16-01-2010	12.00	8.50	-3.50	227.76	161.33	-66.43
17-01-2010	70.50	55.50	-15.00	1338.09	1053.39	-284.70
18-01-2010	82.50	64.50	-18.00	1584.69	1242.27	-342.43
19-01-2010	299.92	310.50	10.58	6061.84	6274.52	212.68
20-01-2010	290.21	295.50	5.29	5959.11	6078.34	119.22
21-01-2010	370.96	354.50	-16.46	7540.95	7243.10	-297.85
22-01-2010	479.72	478.50	-1.22	9554.30	9598.86	44.56
23-01-2010	171.00	169.50	-1.50	3462.34	3435.99	-26.35
24-01-2010	8.50	8.50	0.00	161.33	161.33	0.00
25-01-2010	8.50	7.50	-1.00	161.33	142.35	-18.98
26-01-2010	19.50	20.00	0.50	370.11	379.60	9.49
27-01-2010	127.50	118.75	-8.75	2634.89	2460.37	-174.52
28-01-2010	178.58	169.50	-9.08	3658.08	3464.23	-193.85
29-01-2010	282.78	262.50	-20.28	5654.56	5273.76	-380.80
30-01-2010	207.00	213.75	6.75	4205.27	4352.93	147.66

Figure 10: Separate management analysis page

7.2 Functional description Parking Planning Tool (in Dutch)

Before starting the development of the Parking Planning Tool a functional description was written and discussed to make sure that all important things would be included in the tool. This functional description is inserted below.

Benodigde input

Opbouw /demontage

- *Gebruikte hallen*
- *Aantal exposanten*
- *Uniforme : unieke standbouw*
- *Aantal dagen opbouw/demontage*
- *Aankomstcontrolelijst en export pakbonnen uit Interflex*
- *Gelijktijdige andere beurzen*

Bezoekers parkeren

- *Handmatige input uit verschillende bestaande Excel modellen (planning bussen en terreinen)*
- *Kostenvariabelen (gem. kosten voor bushuur, personeel, huurauto 's enz., via I&L)*
- *Aantallen geparkeerde auto 's (per terrein, afkomstig van Parking)*
- *Gegevens uitrijden parkeergarages (via Cees James)*
- *Aankomstcontrolelijst en export pakbonnen uit Interflex*
- *Nationale/internationale beurs*
- *Aantal dagen beurs*
- *Verkochte abonnementen*
- *Beschikbare garages / terreinen. (Klantafspraken over gereserveerde garages, andere afspraken)*
- *Gelijktijdigheid andere beurzen*
- *Openingstijden beurs*
- *Bijzonderheden zoals kinderwagens, slecht weer, etc.*

Gewenste output

Advies in te zetten terreinen, voor bezoekers parkeren en voor vrachtverkeer

Advies aantal pendelbussen

Advies aantal verkeersregelaars en coördinatoren

Planning aantal huurauto's (buurtposten) + tekstwagens

Advies wel/niet bufferen vrachtverkeer

Geplande + daadwerkelijke inzet personeel (dag, week en maand basis)

Geplande + daadwerkelijke inzet pendelbussen (dag, week en maand basis)

Management samenvatting:

- *verschillen in planning en realisatie*
- *totaaloverzichten kosten*
- *ratio verkeersregelaars : geparkeerde auto 's*
- *gemiddelde bezetting terreinen*

7.3 Memo Lorry Parking policy change (in Dutch)

The memo that is included below contains a description of the desired future Lorry Parking policy, the necessary changes and the rationale behind this decision.

AAN: AFD. ACCOUNT MANAGEMENT
VAN: NISETH VAN DER MEULEN & ROBERT VAN DER MAST (AFD. PARKING)
ONDERWERP: WIJZIGING BELEID LORRY PARKING
DATUM: 10 MEI 2010
CC: AFD. PARKING

Wijziging beleid lorry parking

Na een intensieve evaluatie van het huidige Lorry Parking beleid en de praktische gang van zaken is de afdeling Parking voornemens om Lorry Parking volledig uit te besteden aan een externe partner.

Uit de evaluatie blijkt namelijk dat het aanbieden van Lorry Parking leidt tot extra administratieve en operationele belasting die vooral tijdens drukke beurzen ongewenst is. Een korte samenvatting van de belangrijkste knelpunten:

- In de praktijk blijkt dat ca. 20% van de Lorry Parking aanvragen van tevoren geboekt wordt via Exhibition Services. De overige 80% betreft ad hoc on-site boekingen. Deze laatste categorie vereist administratieve handelingen en dus tijd van operationele medewerkers die daar niet voor ingepland (en bedoeld) zijn.
- Lorry Parking vereist het gebruik van parkeerterreinen die tijdens de beursdagen nodig zijn voor het parkeren van personenauto's. Aangezien de parkeercapaciteit de afgelopen tien jaar al drastisch is afgenomen door het wegvallen van verschillende externe terreinen en infrastructurele aanpassingen op en rondom het RAI-complex, is het tijdens de grote beurzen wenselijk om zoveel mogelijk vrije parkeercapaciteit te kunnen aanbieden aan beursbezoekers.
- Een klant die gebruik maakt van Lorry Parking mag logischerwijs verwachten dat de RAI zorg draagt voor beveiliging van het betreffende terrein. Bij kleinere evenementen is dit niet direct een probleem omdat de vrachtwagens dan op het RAI terrein zelf geplaatst kunnen worden. Echter, bij grotere beurzen waarbij geen ruimte is op het RAI terrein moet gebruik worden gemaakt van een extern terrein, waarbij het faciliteren van een beveiligde Lorry Parking mogelijkheid de nodige kosten met zich meebrengt.
- Om de opbrengsten uit Lorry Parking te maximaliseren is dagelijkse controle nodig (wat extra mankracht vereist), omdat het merendeel van de gebruikers zich niet vooraf aanmeldt. Dit betekent dat voor elke vrachtwagen die zich 's nachts op het RAI terrein bevindt, moet worden nagegaan of deze al geregistreerd is (kan middels een lijst met kentekens). Is dit niet het geval, dan wordt er alsnog getracht het Lorry Parking tarief in rekening te brengen door de standhouder te achterhalen en deze te factureren.

Met bovenstaande knelpunten in het achterhoofd is er gezocht naar een goede oplossing die de RAI in staat stelt om zowel de leveranciers (de gebruikers van Lorry Parking) als de beursbezoekers zo gastvrij én efficiënt mogelijk te faciliteren.

De belangrijkste uitgangspunten bij deze zoektocht:

- Administratieve en operationele belasting minimaliseren (zowel uit kosten als efficiency overwegingen).

- RAI parkeerterreinen zo schoon mogelijk houden ("clean terrain policy"), om zowel het op- en afbouwverkeer als het bezoekersparkeren optimaal te kunnen faciliteren.

Met deze uitgangspunten zijn we gekomen tot de oplossing om Lorry Parking uit te besteden aan een externe partner die zelf beschikt over voldoende (over-)capaciteit op een eigen terrein in Amsterdam. Te denken valt aan logistieke bedrijven met een eigen overslag in het havengebied. Deze externe partij zal zelf verantwoordelijk zijn voor de administratieve en logistieke afhandeling van Lorry Parking klanten.

Voordelen voor de RAI en de afdeling Parking in het bijzonder:

1. Er hoeft geen kostbare eigen parkeercapaciteit gebruikt te worden. Tevens zijn er geen kosten voor het optuigen van een externe Lorry Parking faciliteit en het beveiligen van dit terrein.
2. Administratieve afhandeling wordt beperkt tot het ontvangen van een commissie over de gerealiseerde Lorry Parking opbrengsten (en eventueel het steekproefsgewijs controleren van de opgegeven aantallen).
3. Operationeel personeel wordt niet belast met controle taken en administratieve afhandeling van on-site boekingen.

Met deze uitbesteding zullen de tarieven wijzigen. Het uiteindelijke tarief zal in samenspraak met de externe partner bepaald worden. Wel staat vast dat het onderscheid tussen vrachtauto's met een lengte tot 6 meter en die met een lengte van meer dan 6 meter zeer waarschijnlijk gaat verdwijnen. Er zal één uniform tarief komen, wat administratie en controle vereenvoudigd.

Momenteel is de afdeling Parking in gesprek met mogelijke partners die Lorry Parking in de toekomst zouden kunnen faciliteren. Zodra er concrete aanbiedingen op tafel liggen, zal dit gecommuniceerd en besproken worden met alle ontvangers van deze memo.

7.4 Map of parking terrains

In the picture below you can see a map of all the internal parking terrains and directions to some external terrains (P15, P17 and P18). The terrains P1, P2, P3 and P7 are underground parking garages. Terrains P4, P5, P9 and P10 are used as 'work terraces' for freight traffic, but can also be used for car parking during busy exhibition days.



Figure 11: Map of parking terrains at Amsterdam RAI

7.5 Data model Parking Planning Tool (in Dutch)

On the next page you can find the data model that was used to design the database tables for the Parking Planning Tool.

Variabelen (Afd. Parking/IL&L)
Bus: kosten per uur per type
Huurauto: kosten per dag
Personeel: kosten per uur per taneigroep
Terrainen: huur per dsj (indien van toepassing)
Tekswagens: huur per week(deel)
Portocabins: huur per dsj/week

Bezoekers (Acc. Mngt/Afd. Parking)
EvenementID
Datum
Verwacht
Realisatie

Vrachterverkeer (Afd. Parking)
Datum
Verwacht
Realisatie
Gebruik werkterrassen
Gebruik bufferterrainen
Gebruik parkeergarages

Bezoekersparkeren (Afd. Parking)
Datum
Verwacht # auto's
Realisatie # auto's
Weekdag (ms, di, wo enz.)
Weersomstandigheden (temperatuur, droog/nat, gladheid)

Hal (Afd. Parking)
Nummer (ID)
Oppervlakte
Max. aantal auto's te parkeren

Evenement_Hal
EvenementID
Hal ID
Datum
Beschikbaar voor parkeren (nee/ja)

Evenement (EBMS/Afd. Parking)
Naam
Type (beurs, congres, theater)
Opbouwperiode startdatum (incl. tijd)
Opbouwperiode einddatum (incl. tijd)
Startdatum bezoekers
Afbraakperiode startdatum (incl. tijd)
Afbraakperiode einddatum (incl. tijd)
Type evenement (vakbeurs, publieksbeurs, nvt)
Type publiek (internationaal, nationaal)
Gem. # passagiers per auto
Oppervlakte (m ²)
exposanten
uniforme standbouw / # eigen standbouw
Capaciteitsverlies pendelbussen (trolleys e.d.)
Extra rijtijd pendelbussen (inladen trolley's e.d.)
Avondopening

Evenement_Parkeerterein
EvenementID
Parkeerterein ID
Datum
Planning gebruiken (nee/ja)
Realisatie gebruikt (nee/ja)
Maximum auto's geparkeerd (piek)
Terrain open (tijd)
Terrain gesloten (tijd)
Gebruik (auto, vracht, buffer, lorry parking)
gereserveerde plaatsen (exposanten e.d.)

Overige kosten (Afd. Parking/IL&L)
Tekswagens
Portocabins
Plaatsen hekken en rijplaten

Inzet huurauto's (IL&L/Afd. Parking)
Datum
Gebruik (buurtpost, coördinator, afrekenen)

Inzet pendelbussen (IL&L/Afd. Parking)
Datum
Locatie (Parkeerterein ID)
Planning inzet (uren)
Realisatie inzet (uren)
Type bus (standaard, geleed., touringcar)
Passagiers vervoerd
Aantal slagen

Inzet personeel (IL&L/Afd. Parking)
Datum
Locatie
Planning inzet (uren)
Realisatie inzet (uren)
Functie (of taneigroep)

Parkeerterein (Afd. Parking)
Nummer (ID)
(Locatie)
Max. aantal auto's geparkeerd
Pendelbus nodig (nee/ja)
Buurtpost nodig (nee/ja)
Aanrijtijd minimum (in minuten)
Aanrijtijd maximaal (in minuten)
Benodigd aantal verkeersregelaars
Via snelweg (wel/geen touringcars)
Break-even punt aantal auto's
Gem. kosten ingebruikname