Between screens: developing a model of screen quality for films in Dutch commercial cinemas, art-houses and municipal cinemas.

June 2006

Contents

Summary

This research is a (first) attempt in (rationalizing and giving more transparency to) systematizing arguments in screen selection as used by film distribution companies in their negotiations on the release market with cinema exhibitors.

A-Film, one of the independent distributors of (mainly European) art house and mainstream films in the Netherlands, asked the Netherlands Film Research Foundation/PSAU to explore the possibility to predict[1] the number of admissions for a specific film. This research is a pilot study aimed to develop a screen quality index system (SQI). This SQI should be used to determine the amount of 'performance quality time' that a certain film receives in comparison to other films.

In this study a theoretical methodological analysis is presented, followed by a first, very limited empirical exploration, in order to answer the question whether it is possible to construct a SQI that influences the number of admissions based on screen characteristics.

The availability of data was limited for this pilot, while data needed turned out to be impossible to extract electronically from the existing system, and therefore had to be treated manually. Therefore, the SQI is determined based on day and time only and not on any information concerning physical or typological characteristics (location, capacity) or date. The empirical test concerned the question how well admissions can be predicted from these two content independent variables.

The variable analysis shows, that 12% of the variance in number of admissions can be explained by the SQI *as was defined in this pilot study* (i.e. based on only day and time of performance). Based on the proportion explained variance it is advisable to further explore a model that gives a more clear view on this influential factor on the number of admissions to film screenings.

Future research can only be executed under the following conditions:

1. The database should comprise at least 3 years' worth of data;
2. Data from a number of residential areas should be available;
3. Within each residential area data from all cinemas should be available.

The new NFC Postbus system is expected to solve these problems in future research.

[1] Please note that, by prediction is not meant prediction of future admission numbers. This study concerns the method to find empirical proof for or explanation of past admission numbers.

Preface

Intention, set-up and nature of the research project

In November of 2004, the Netherlands Film Sector Research Foundation was approached by well-known producer San Fu Maltha (at that time also majority shareholder and CEO of A-Film Distribution Ltd.) and asked if it would be possible to quantify the effect on admissions of screening a film in a certain cinema or one of the auditoria therein. With that question he did not mean "screen quality" in a narrow technical sense, but rather as an indicator of the place a film is allocated within the total programming of a cinema company. He had come to this question because of his impression that European films suffer by a certain disfavouring in the programming of cinema exhibitors.

It may be obvious that the Film Research Foundation's board was much interested in the carrying out a research project in this field, because despite the efforts of the MEDIA Programme of the European Union, the market shares of (non-domestic) European films in West European countries including The Netherlands had not shown a substantial increase, and because the methodological aspects of such an investigation seemed to be rather interesting.

To avoid any misunderstanding, I want to stress that San Fu Maltha did not ask the Research Foundation to prove the correctness of his impression, but to test its accuracy. Although he would be somewhat amazed if the assumption would turn out to be not correct, even so, any result would be considered worthwhile.

Shortly after Mr. Maltha's initiative, a brainstorming session took place in the office of A-Film[2]. During this meeting it became clear that the problem at hand was rather complicated: not only because of the large number of involved factors, but also because of the methodological and statistical problems. The participants of the meeting agreed that the total research project would have to consist of some consecutive phases, that it would be very labour-intensive and consequently would involve a rather large amount of money. Understandably, these were consequences that San Fu Maltha had not completely foreseen when he first approached the Research Foundation.

Whilst A-Film as a distributor of many European films is of course interested in the question at hand, it can be assumed that this is also the case for some other Dutch distribution companies, as well as similar distributors in other West European countries. In addition to this, the (MEDIA Programme of the) European Commission, who has for years been struggling to strengthen the position of the European film, can also be expected to be interested in an investigation into the possibility of disfavouring European films in cinema programming.

In order to gain more insight into this final aspect, the chairman and the permanent secretary of the Research Foundation had a meeting with Dominique van Ratingen MA, head of the MEDIA Desk Netherlands. Not being in a position to make promises, of course, she saw the possibility of an involvement of organizations in other West European countries and/or the European Commission, but only after the Neth. Research Foundation would have

[2] The participants were: G.L.J. Bunnik MA (dpt.-chairman of the Research Foundation), Merel K. Gilsing MA (perm. secr. of the Foundation/PSAU), Professor P.J. van den Hoven PhD LLM (Dean of the Professional School of the Arts of Utrecht University [PSAU] with which the Foundation is associated), Lisa W.J.M. Janssen MA (PSAU), S.F. Maltha BA, and J.Ph.Wolff PhD (chairman of the Foundation).

made it clear that the methodological and statistical problems are solvable[3]. Taking this as a starting point, San Fu Maltha was prepared to commission the Research Foundation to carry out a pilot study as the first phase of the research project, i.e. to investigate the methodological aspects. As a positive result could not be guaranteed, and because a positive outcome would also be of interest to third parties (competitors), this was a praiseworthy attitude, be it that, understandably, a rather limited amount of money was offered for the pilot study, which then had to be accepted by the Research Foundation as a condition limiting the scope of the study.

As explained in Section "Information sources" of this report, the first processing of data had to be done by hand, which turned out to be a labour-intensive task. After this task was completed, a graduate of Tilburg University, Roberto Djadoenath MA, who recently had written a master thesis about the preferences of cinema goers, offered to carry out the calculations based on the assembled data and to write a draft of the report. This work has been done under the supervision of Merel Gilsing MA and Dr. J.Ph. Wolff and with advise from professor doctor H. van den Bergh (methodologist Utrecht University), under the guidance of Professor Van den Hoven. The latter and Roberto Djadoenath preferred to restrict the analysis primarily to the objective aspects of screen quality, being the starting times and the days of the week of the cinema performances, on which a regression analysis was based. By doing so, judgements by peers were precluded. As may be obvious, however, the concept of "screen quality" does include more than starting times and days (and seasons): significant are of course also criteria like stadium seating, parking facilities, good air conditioning, big screens, spacious foyers, etc[4]. Including these kinds of technical criteria in the operational concept of screen quality may, as mentioned in the section “Evaluation” result in a substantially higher proportion of the variance in number of admissions to be explained by the *screen quality index* (*SQI- see Introduction)*.

In order to come to a realistic use of this *screen quality index*, a number of grades of technical qualities of cinemas/auditoria will have to be distinguished. To do this as objectively as possible, the relevant criteria will have to be divided into groups, some of which can be based on criteria having an indisputable (i.e. ex ante) objective character (as e.g. stadium seating, tip-up seats or not), but for some other criteria, prior judgements by peers will be necessary in order to give them an ex-post objectivity.

I expect that it will be possible in this way to elaborate an applicable concept of screen quality index. I am of the opinion that it is not possible to do this in the same way for the *film quality index (FQI)* mentioned in Section "Methodological analysis". Therefore, I think that the statement in that section, "this research [meaning this first part of the pilot study] is not aimed to the FQI in itself", is called for. This nevertheless means, that, just as for the screen quality index, some aspects of a FQI are objective (like language and country of origin), whilst others are open to objectification, namely, as mentioned in the report, e.g. commercial versus art house films, to which a more general classification of genres could be added. For both indices, it may turn out to be necessary to determine first the weights of groups of experts' criteria (i.e. a search in the reverse order as the main research).

---

[3] Because of the possibility of interesting also organizations in other countries, it was decided to write this report in English. For that matter, the quality of the film statistics in only a limited number of countries would allow the making of the necessary calculations. [See: E.J. Borsboom and J.Ph. Wolff (eds.), "Proceedings of the Seminar on Film Statistics organized by the foundations for research, resp. for statistics of the Neth. Cinematographic Federation on 26 June in Amsterdam" (Amsterdam, July 2002).]

[4] See e.g. European Cinema Yearbook (MEDIA Salles), Section 10 of the Methodological Introduction.

The next steps towards a completion of the research would be extending the data in respect of the involved cinemas and cities/towns, as well as – to make it possible to speak about disfavouring at all – in respect of a number of exhibition companies having significant market shares.

The report on this pilot study has an abstract and somewhat esoteric character. Impeding as this may be, this pilot study concerns a necessary first step towards a lowering of the level of abstraction in order to achieve an analysis reflecting the theatrical distributors' and cinema exhibitors' practice.

To make it possible to answer the question asked by A-Film, much research still needs to be carried out, and it would be worthwhile to do so, because we have to know (much) more about the programming of European films. My expectation is, that the research project will have to be directed towards comparisons of numbers of admissions to European and to American films of comparable commercial potential (*FQI*) in auditoria with about the same screen quality indices, programmed by different exhibitors. To make this possible, a great deal preparatory research will have to be carried out.

Dr. Joachim Ph. Wolff,
Chairman of the Film Sector Research Foundation

Introduction

The admissions of film screenings in cinemas, art houses and municipal cinemas in the Netherlands are dependent on several factors. The three main factors are (in order of assumed importance):

(1) the characteristics of the film screened;
(2) the characteristics of the screen on which the screening takes place;
(3) a number of unknown (possibly influential but not yet demonstrated or discovered) or uncontrollable (measurement is practically impossible) random factors (such as the weather of the day, the economic climate, competition of other amusement and the national rate of internet-facilities, which make it possible to come to a quick (il-) legal consumer-release).

A-Film, one of the independent distributors of (mainly European) art house and mainstream films in the Netherlands, asked the Netherlands Film Research Foundation/PSAU to explore whether factor (2) can be modelled as a Screen Quality Index (from now on, referred to as SQI), on the level of theatrical-release. If this turns out to be possible and factor (2), relative to factor (1) is of any importance, this SQI can be used to determine the amount of 'performance quality time' that a certain film receives in comparison to other films. This would thus supply an empirical base to verify a number of intuitive judgments and to answer a number of questions such as "Is it true that the Europeans films receive less 'performance quality time' than American films in theatrical releases?" Or, more preliminary: "Is it possible to discriminate between films?" Important to notice is, that the SQI could function as a discriminating factor on the level of cinema selection in the first and following weeks of theatrical release, and therefore be used as a tool for promotional strategies as well. The proposed SQI is thus a (first) attempt in (rationalizing and giving more transparency to) systematizing arguments in screen selection as used by film distribution companies in their negotiations on the release market with cinema exhibitors.

In this study a theoretical methodological analysis is presented, followed by a first, very limited empirical exploration. The study is meant as a pilot. If evaluated positively this analysis could be expanded further.

Two questions are of great importance:
How well can the number of admissions for a specific film be predicted[5] *from nothing but screen quality characters? Is the accuracy of such a prediction of any significance?*

It is important to keep in mind that the process that influences the number of admissions is more complex than might be expected by only looking into the questions above. There is a possibility that screen characteristics may also be (partly) determined by the films performed on this specific screen. In this way, the programming of film has a direct influence on the SQI and therefore the number of admissions. In some opinions the programming (and therefore, the judgment of the programmers of cinema exhibitors) may even be the most important aspect to determine the number of admissions. Given the high amount of subjectivity in these judgments, this pilot focuses on the availability of factual information.

[5] Please note that, by prediction is not meant prediction of future admission numbers. This study concerns the method to find empirical proof for or explanation of past admission numbers.

Methodological analysis

The request to model factor (2) relative to factors (1), and (3) is an analysis of variances. If a film of a certain type attracts a variable number of admissions on different screens, this must be due to factor (2), i.e. the characteristics of the time and place of the performance, and (3). If a certain 'screen' attracts a variable number of admissions, this must be due to factor (2), the characteristics of what is performed, and (3). Factor (3) is by definition impossible to model, since it is too varied and impossible to measure empirically.

If the influence of factor (2) turns out to be large enough compared to the influence of factor (1), then it is possible and also meaningful to calculate a SQI. The SQI score predicts the expected number of admissions in a performance *as far as this number is dependent on screen characteristics*. If factor (2) turns out to be of substantial influence, this indicates that the SQI explains an interesting part of the variance in the number of admissions in performances. This means the screen on which a product is programmed is of significant importance to the success of a product.

If factor (2) explains an insignificant amount of variance this means that the product (i.e. factor 1, together with a number of uncontrollable random factors, combined in factor 3) determines the number of admissions; this would mean that it is insignificant on which screen the product is programmed and also that discrimination nor promotion by means of the screen programming is possible. If the amount of explained variance by factor (2) is extremely small, a SQI is not a very useful tool. If the amount of explained variance is substantial, then it becomes especially interesting to estimate factor (1) as well.

An explanatory example: If the model is able to identify a SQI that explains 10 % of the variance in the mean numbers of admissions of screens and factor (1) – what is performed – explains 85 % and factor (3) – other variables – explains 5 %. In that case we have to conclude that there is an influence of the screen quality time that a production gets, but it is not so very interesting. The production itself strongly determines the number of admissions.

Suppose we find the same 10 % for factor (2), 15% for factor (1) and 75% for factor (3). A proven high influence of factor 3 would mean we have to conclude that we do not have too much influence on what is happening. But as far as we do have this influence, the screen quality time is almost as important as what is shown: a production can benefit or suffer very strongly from the screens it is shown on.

The request of A-Film should therefore be interpreted as follows:
To answer the question whether it is possible to construct a SQI that influences the number of admissions based on screen characteristics.

A question not explicitly asked by A-Film but which has to be answered in this framework, is whether or not an indicator can be constructed enabling us to distinguish films of comparable commercial potential, without which an articulation about discrimination would be impossible at all. This leads to the following questions:

Answer the question whether it is possible to construct a FQI (i.e. the film quality index) that predicts the number of admissions given film product characteristics. Estimate the relative importance of the SQI compared to the FQI. Indicate what is actually needed to construct and maintain optimal SQI's (and FQI's) for the Dutch screens.
Please note this research is not aimed at the FQI in itself. The FQI is – in the optimal situation – a means to estimate the relative importance of the SQI.

Now, what exactly are the SQI and the FQI? As stated before, the SQI (screen quality index) is an index that gives the best prediction of the number of admissions in a certain performance *that can be made on basis of screen characteristics and screen characteristics alone*. From a technical point of view the SQI is the outcome of a regression equation that is based on as much information we have from the past about the relation between number of admissions and screen characteristics. The steps we have to take to construct this equation are:

a. Determine the screen information that is available
b. Translate the screen information into a limited number of promising variables that can be used in the equation (which means variables on an interval level)
c. Determine the number of admissions per screen (on basis of screenings in the past, no estimates)
d. Perform a regression analysis that generates the equation that is most likely to predict the outcome of (c). Form the variables determined in (b)
e. Calculate the SQI for each screen.

The steps a) and c) are purely practical. Which information is available against which costs? Steps d) and e) are purely technical, done by statistical analysis. Step b) is more complicated since it determines the validity of the indices.

The FQI (film quality index) is constructed as follows:

a. Determine the product information that is available
b. Translate the product information into a limited number of promising variables (for example language, commercial film versus art house film, black and white versus colour or the amount of promotional activities and reviews) that can be used in the equation (which means variables on an interval level)
c. Determine the number of admissions per product (type) (on basis of past screenings, no estimates)
d. Perform a regression analysis that generates the equation that predicts best the outcome of (c). Form the variables determined in (b)
e. Calculate the FQI for each type of product

Two questions need to be answered: what is 'a certain (type of) production'? And what is ' a certain screen'?

A certain production cannot simply be defined as a title. A film in its first week of release is not the same product as a film in the third week of its third re-release[6]. A fortiori a certain type of production cannot merely be defined in terms of a genre (for example American blockbuster); sub genre, et cetera may be important. Another important variable in

this definition is the amount of publicity a film receives, i.e. the impact of local, regional and national promotions and reviews.

A combination of practical experience from the field and theoretical insights should bring up a number of promising variables. However, this is a problem that cannot be solved on theoretical grounds. To solve it on empirical grounds requires a large database. Therefore in this pilot study we have decided not to try to model factor (1) but only to investigate how much of the variance in the number of admissions can be explained by factor (2). If this pilot is evaluated positively the influence of factor (2) can be estimated in a more large-scale investigation. Then the relative importance of factor (1) compared to factor (2) can be estimated. So far we can only estimate the relative importance of factor (2) compared to factor (1) and (3) combined.

A screen can simply be defined as one of the 623 screens to be found in 175 Dutch cinemas, art houses and municipal cinemas in the Netherlands[7]. The SQI can be determined as the average number of admissions during a certain time period. The longer the time period, the more stable we can expect the SQI to be. However, a SQI determined this way will not predict much of the number of admissions for a certain performance, because it will not explain much of the variance. The reason for this is the notion that the moment of the day, the day in the week, the period of the year will be factors as well to determine the attraction of a performance on the audience - apart from what is shown (factor 1), and random factors (factor 3). If we would simply calculate an SQI on the basis of the number of admissions during a certain period for each of the 623 screens and subsequently calculate which proportion of the variance in the number of admissions in a certain performance can be explained by this SQI it will certainly be a very low proportion.

It is also possible to define a screen more abstractly. Possible variables (besides the physically different screens) to distinguish screens could be day and time of performance.

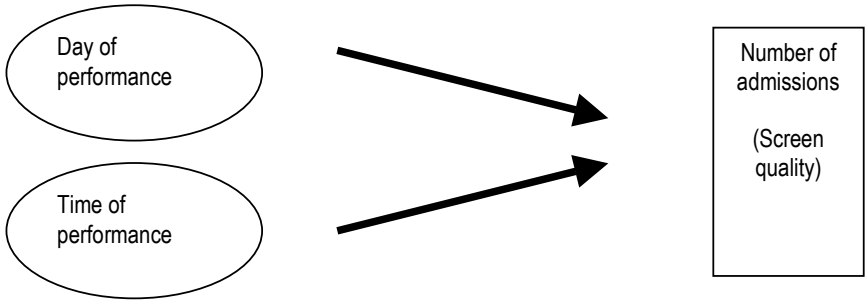

Figure 1

These variables explain part of the variance in admissions, independent of what is shown on the screen. Another way to distinguish screens is on a geographical basis. For instance, the distance between a certain screen and the centre of a city can be a geographical variable that influences admissions. Many different categorisations are possible. The

[6] This specific hypothetical example will rarely take place nowadays

[7] In 2004 there were 143 commercial cinemas with in total 553 screens and 32 municipal cinemas with weekly performances, having 70 screens in total. (source: Yearbook NVB/NVF 2005). The number of commercial art houses was 35 (source: European Cinema Yearbook).

question posed by A-Film is which proportion of the variance in admission is explained by differences between screens in terms of all these –content independent- variables. As mentioned earlier, the SQI is a (first) attempt to rationalise and give more transparency to arguments in screen selection as used by distribution companies in their negotiations in the release market with exhibitors.

Information sources

In order to execute research to give insight into the SQI, FQI and predictions for the number of admissions, certain information should be available. Five elements of information are essential for this research, namely information concerning:

1. Time of performance
2. Date of performance
3. Number of admissions
4. Cinemas / screens
5. Performed film

The more specific information needed for each of these elements will be discussed further in this section.
The number of admissions is an essential element because A-Film requests in fact a prediction for this element. This prediction will be based on past admissions. The number of admissions should concern individual cinemas and specific films that were screened in cinemas on certain dates and times. This means that the number of admissions for every single screening within all (participating) cinemas needs to be known. The information needed concerning the screens must include information that is used as the base for distinction. The most used and common distinctions between screens are based on either geographical or typological matters of the venue. Which distinctions seem promising is a matter of debate. If we think about geographical environment (i.e. big city, small village, accessibility) and typology (i.e. large, medium, small, part of large complex, small complex, independent, ' quality'), these data are easy to collect. The final essential element of information need concerns the performed film. To determine the FQI, one wants to categorize films according to variables with predictive potential. This desk analysis is not dependent on cinema information sources (i.e. the Film Information System or Postbus). After obtaining the necessary information, an analysis will be made to find out what the contribution is of each essential element to the number of admissions. Each distinction may lead to a certain result on a scale that acts as a multiplication on the average number of admissions. Schematically this can be portrayed as in figure 2.

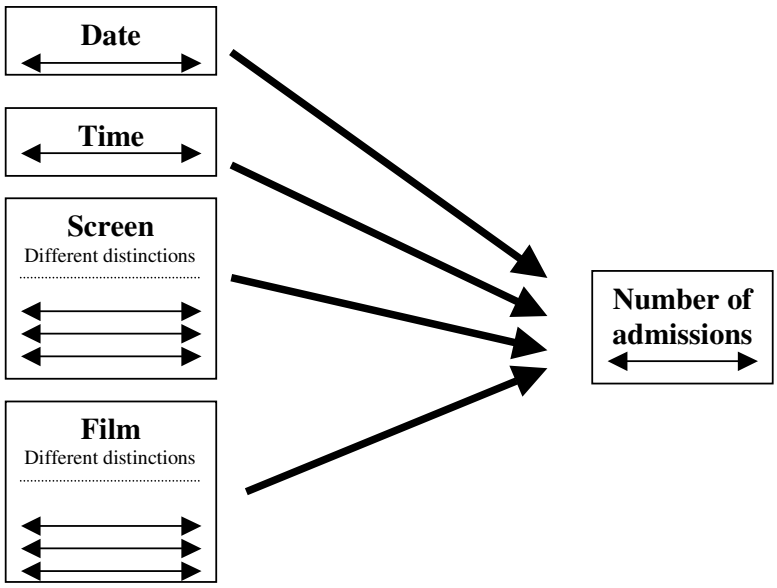

Figure 2

Availability of data

The availability of data was limited for this pilot. The reason for this was that the data needed turned out to be impossible to extract electronically from the system, and therefore had to be treated manually. Therefore, Wolff Cinema Group offered to make their data available for the benefit of this pilot research. This means the data have to be treated confidentially and are only used internally for causes of this research. Also, no data made available by Wolff Cinema Group will be explicitly mentioned in the end report nor any reports concerning this research, as is guaranteed by PSAU.

If this study will be evaluated positively and is expanded further, more cinema companies will be approached in order to collect more appropriate data. Another goal for expanded research will be the collection of data from more than one year of cinema admissions. In an extended study on a larger dataset, other variables can be constructed with improved predictive validity.

The actual analysis: a pilot

In this pilot the SQI will be determined based on day and time only and not on any information concerning physical or typological characteristics (location, capacity) or date. The empirical test concerned the question how well admissions can be predicted from these two content independent variables (factor 2). This limitation was chosen in order to make it least likely that there is no contamination with factor (1) – the type of film performed.

For "day of performance" simply the distinctions of the days of the week were used: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday and Sunday. Regarding the "time of performance" six distinctions are made for performances on different parts of the day: first afternoon, second afternoon, evening, first evening, second evening and night. In table 1) an overview of the time period for each distinction is given. For this distinction, the advice of the program officer of the cinema group was inquired.

Performance	**Starting time between**
First afternoon	12:30-15:00
Second afternoon	15:05-17:55
Evening	18:00-19:30
First evening	19:35-20:55
Second evening	21:00-23:15
Night	23:20-02:00

Table 1

This rough model would generate about 667 [8](Dutch physical screens) times 7 (days of the week) times 6 (performance times) = 28.014 screens, each with its individual SQI. These 28.014 are considered as 'moments of performance'. Using a statistical method that reduces the amount of variables, all moments of performance (every combination of day and time of performance) are classified into six categories[9]. Each category consists of moments of performance that have approximately the same effect on the number of admissions. Of course, the effect on admission number within each category has a higher similarity than between different categories. By generalising over a number of screens (physical screens times performance date times performance day times performance time), more stable and therefore more meaningful average numbers of admissions are created. This average is –given the limited set of data- the best predictor of the admission number for a performance in a certain category. A reference category (category 3) had to be made and the deviation from this reference led to chronological definition of all six categories. The categories are:

- Category 1: Deviation of –15 and lower.
- Category 2: Deviation between –15 and 0.
- Category 3: Deviation between 0 and 7.5.
- Category 4: Deviation between 7.5 and 20.

[8] Source: Yearbook 2004 by NVB (Netherlands association of cinema exhibitors) and NVF (Netherlands association of film distributors), number of (physical) screens in the Netherlands

[9] In the appendix a more detailed explanation of the method used is given.

- Category 5: Deviation between 20 and 30.
- Category 6: Deviation of 30 and higher.

The SQI ranges can be interpreted best by considering category 3 is leading to approximately the average number of admissions. Category 1 results in the lowest number of admissions and category 6 in the highest number. Note that the fluctuations in admissions are only based on the screen characteristics day- and time of performance. Date of performance as well as physical characteristics of screens are expected to lead to additional fluctuations in admissions. All characteristics only reflect (part of) the influence of factor (1) or SQI. Table 2 shows the result of dividing all moments of performance into the categories. The numbers inside the cells reflect the number of the category in which a moment is classified.

Day performance / **Time performance**	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
First afternoon	3	3	3	3	3	3	4
Second afternoon	2	2	1	1	1	3	3
Evening	4	4	4	5	6	6	3
First evening	3	3	3	3	3	5	2
Second evening	3	4	3	4	6	6	2
Night					1	2	

Figure 2

The crucial question can now be answered. How well does this index –purely based on content-independent factor information –predict admission numbers? How high is the predictive value? In order to check the predictive power of the model, a predicting variable should be constructed. The method used to construct such a variable is regression analysis[10]. The database was sliced up into two parts (the complete database consists of approximately 15.000 performances). The first part consists out of 70% of all data. The predictive variable was constructed by a regression analysis based on this 70% of the data. The second part, 30% of the data, was used to check the predictive power of the predictive variable. The correlation between the prediction and the real number of admissions for 30% of the data turns out to result in a proportion explained variance of approximately 12%: this means that 12% of the variance in number of admissions can be explained by the SQI *as was defined in this pilot study* (i.e. based on only day and time of performance).

As mentioned before, the importance of this percentage is not completely clear without knowing the percentage of the variance in number of admissions explained by the FQI. However, a model that is based on this very limited dataset and still explains 12% of the variance in number of admissions gives enough reason for further interest in developing a (complete) model for predicting admissions from factor 1 variables. A more reliable database containing data from over a longer period will have to prove the correctness of this first initiative that resulted in the percentage of 12%.

[10] A regression analysis makes it possible to predict values of a dependent variable by knowing values of one ore more independent variables.

The predictive power of SQI is, of course, very likely to become higher when other relevant variables (date, physical characteristics) are added.

In future research the effects of the FQI on the number of admission may also be added to the model. This way we can gain an even more complete image of the influence of factors on the number of admissions. Possible ways to add these variables into the model are given in the evaluation.

Evaluation

Problems

The most important practical problem concerns collecting the data. As mentioned before, it was not possible to extract the needed data electronically from the system. Therefore, a choice was made to enter the data manually, a time-consuming process. As a consequence, the dataset used contained only data from one specific year and one city. The limitations of the database hamper the precision of the results. Working with only data from one year may lead to distorted results because the quality of the films that were released in this specific year is likely to have had an impact on the number of admissions. If data about the number of admissions over several years is entered in the database, the impact of one year with relatively bad or good films is compensated by the results of other years. Eventually, the database will get closer to the average number of admissions when the number of years the data is collected for increases. A database for at least three, but preferably more, years should be made available for future research.

A more time-related problem the team was confronted with during the pilot research was the amount of time that was lost for entering all data manually. There was also some time lost by recoding[11] variables, but this is a one-off process and has and can be duplicated in the future.

Conclusions and advice for further research

The SQI in the pilot is a predictor that is based on a limited database. Even though this predictor can be seen as a good starting point, it is advisable to repeat the process that was done for the pilot research in the future when a more reliable and comprehensive database is available. This should lead to either a confirmation of the original six categories or to an adjustment of these categories.

A-Film is interested in the question to what extent admission numbers are determined by factor 2 (and therefore film admissions can be influenced by programming policies). Is it advisable to investigate further in this research? The advice about this is based on the proportion explained variance of 12%. The main question is whether this percentage is correct, can become much higher, or is too high. In the worst case the limited database has led to a distortion of a higher than real proportion explained variance. But the opposite might also be the case. More important is the fact that the SQI has been simplified in the pilot research and in future research an extension of the SQI is very likely. Adding variables that are based on the geographical position or the type (in the widest sense of the word) of a cinema is most likely to lead to a higher (known) impact of the influential power of the SQI (and model). As long as the impact of the FQI and therefore the relation between the SQI and FQI is not known, a percentage of approximately 12% of proportion explained variance is quite high. Based on the proportion explained variance it is advisable to further explore a model that gives a more clear view on this influential factor on the number of admissions to film screenings.

[11] Recoding used for altering a (part of a) variable way or making a division between classes.

Advice

While this pilot research was executed, a new system regarding the Dutch admissions was being developed by the NVB and NVF. This system, i.e. the NFC Postbus, is an improvement of the existing system to store data about admissions and performances electronically. The postbus, when used properly, can save quite some time in manually entering data. When possible, this system should be extended with data that will be used for future research. This should be discussed with several parties within the cinema branch. It should be taken into account however, that only new data would be available from this new postbus, and not data from the (recent) past. Building up a new database with data of at least three years will take some patience. If further research before this time is required, an option would be to broaden the scope of this pilot research, by sampling more screens at more and more diverse locations in the Netherlands. However, a vast extent of manual work needs to be taken into account.

Another more general advice concerns the hiring of a database manager who has the skills and knowledge to adjust all variables in such a way that all data is transferred automatically into values for all divisions that were made. This should be someone with a statistical background and experience with programming in statistical programs.

This report will end with three conditions that data for future research should minimally meet.

4. The database should comprise at least 3 years' worth of data;
5. Data from a number of residential areas should be available;
6. Within each residential area data from all cinemas should be available.

1) The pilot research is based on data from one year. This turns out to be too limited. Not only does this mean that there is a possibility that the data produces a distorted picture of the admissions, if in that year an extraordinary number of films that were looked out for are released; the reverse may also be the case (a relatively large number of films that were not looked out for are released in a certain year). As the number of years for which data is collected increases, the prevention of this distortion will rise equal to this. In order to prevent the impact of the film releases in one year, a minimum of three years is necessary. Needless to say, exceeding these three years will only lead to a higher degree of data reliability. The availability of correct and complete data from past years may be a disadvantage or even lead to impossibility to satisfy this condition.

2) The pilot research is only based on data from one Dutch city. This city is not representative for the Netherlands. Of course the scale of research determines the scale of the sample. In order to draw correct conclusions for a big area or even whole country, data from more than one city is obviously needed. It is more likely that in order to draw conclusions concerning the Netherlands at least 20 residential areas (cities, small towns and villages) should be measured. When the scale of the research increases, such a minimum could be taken as a reference point for each additional country. For medium-sized and smaller residential areas the number of admissions might be harder to obtain. On the other hand, bigger residential areas show disadvantages concerning the amount of cinemas that are located within them. This will be discussed in the last condition for future data.

3) Only data from a handful of cinemas were available for the pilot research. For Utrecht this means that data from the majority of the cinemas in this city were taken into account. It could be possible that these cinemas have a

common factor. Besides this, the company is not represented in the same way in other cities. Therefore it is far more advisable to add data from all cinemas within the residential areas that are picked for (the sample of) the research area. The guarantee of confidentiality should make obtaining this data from different parties much easier. It is important that the standard manner of displaying and collecting data is set before approaching all participating companies.

More specific advice

When a variable representing date is added to the model, it is recommendable to divide this variable into three divisions of arguments, namely negative, neutral and positive. For example: in the Netherlands the 5th of December would be a negative date and the second day of Christmas would be a positive date. These divisions reflect the effect that is expected on the number of admissions.

The number of variables that represent the screen can be extended further with geographical and typological aspects. After all divisions are clear, the database manager should be able to program these in a statistical programme that will automatically provide the correct values for every variable for all new data.
When all divisions for elements of the SQI are made, adding aspects of the FQI is the next step. The performed films should be divided in the desired way first and here also the database manager should programme these divisions into a statistical program afterwards.

Appendix

In this appendix all steps taken from the deliverance of the data to the calculation of the proportion of explained variance will be described.

Adjusting the data

After the data were made available by Wolff Cinema (as available in the Film Information System of this company) the first adjustment had to be made. The original data focused on the total number of admissions per day while for this research the number of admissions per performance was needed. The solution for this difference was solved by entering all numbers of admissions per performance manually, using the available overview of numbers of admissions per day, a time-consuming process. After determining on what factors the SQI would be based in the pilot research (day and time of performance), the values for the variables representing these factors were recoded. For the days of performance 'Monday' was coded as 1) and every following day in the week was coded chronologically until 'Sunday' (coded as 7). For time of performance the following recoding was made: 'first afternoon' as 1), 'second afternoon' as 2), 'evening' as 3), 'first evening' as 4), 'second evening' as 5) and 'night' as 6). A dummy-variable for each possible value was created after the recoding of these two variables. Next the new variable called moment of performance was made. This variable contains values that are a combination between day- and time of performance, for instance 'Monday first evening'. In total 37 combinations were made (seven days in the week times six times of performances minus five performances in the night that did not occur). Also, dummy-variables[12] for each value of moment of performance were created.

On the site www.IMDB.com the titles of all performed films were entered in order to find out what the (main) country of origin of each film was. With this information, new variables for the country of origin were added to the database. After recoding, all these variables for country were divided into different categories of origin. The four categories distinguished are: U.S., Domestic, European (non-domestic) and Other. Again dummy-variables for each category were created. In this pilot study no further analysis is made with the different categories of origin, but this will be an important variable for future research.

Analysis

After these adjustments a regression analysis with moment of performance as independent and the number of admissions as dependent variable was executed**.** With this method it is possible to predict values of a dependent variable based on one or more independent variables. A regression analysis results in an estimation of the linear connection between the dependent variable and the independent variable(s). This linear connection represents the best fitting straight line that can be drawn through all the results of the values of Y for X in a coordinate system. This line consists of an intercept, one or more slopes, an error and the variables. The intercept is the intersection with the Y-axis and the slope reflects the slope of the line. In a formula this can be formulated as follows:

[12] A dummy variable is a variable with only two values: '0' and '1'. These values indicate whether something has ('1') or has not ('0') occurred.

$$Y = ß0 + ß1X + ß2X + \ldots\ldots\ldots + ßxX + E$$

Y stands for the dependent variable

X stands for the independent variable(s)

ß1-x stands for the regression coefficient / slope

ß0 stands for the intersection

E stands for the error

In this specific case, the Y would be the number of admissions. The independent variables are the moments of performance. Each moment of performance may turn out (after the regression analysis) to have a different slope. The 'β0' is the moment of performance that is picked as a reference point. The error remains unknown. By judging the slopes, the impact of an independent variable on the dependent variable is known.

The output of this analysis lead to another regression analysis but this time all moments of performance that did not have any significant effect on the number of admissions in the first regression analysis were left out. Taking out variables that do not affect the dependent variable significantly normally results in a higher proportion of explained variance and also leads to an overview that is clearer. The result of the second regression analysis can be found in table 2. The first performance on Monday afternoon is taken as a reference point. The reference point is called in table 2 the '(Constant)'. The number of admissions that -according to the regression analysis- is linked with the reference point, is 25 (in table 2 this is the unstandardized coefficient 'B'). The last column of table 2 indicates the significance from the effect of a moment of performance on the number of admissions. Every value of significance below 0.05 means that that certain moment of performance has significant effect on the number of admissions.

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	25,332	1,241		20,405	,000
	Tuesday	1,913	2,019	,014	,948	,343
	Wednesday	4,734	1,698	,037	2,788	,005
	Thursday	5,835	2,023	,043	2,885	,004
	Friday	7,337	2,852	,058	2,573	,010
	Saturday	4,907	1,833	,043	2,678	,007
	Sunday	22,009	1,780	,188	12,365	,000
	mo2aft	-11,737	3,741	-,029	-3,137	,002
	tu2aft	-12,584	4,024	-,030	-3,127	,002
	we2aft	-17,395	3,473	-,047	-5,008	,000
	th2aft	-20,491	3,741	-,053	-5,477	,000
	fr2aft	-17,576	3,590	-,061	-4,896	,000
	fr1eve	5,182	3,227	,023	1,606	,108
	sa1eve	15,822	2,377	,070	6,657	,000
	su1eve	-14,946	2,389	-,064	-6,255	,000
	tu2eve	15,240	2,582	,065	5,902	,000
	th2eve	12,626	2,557	,055	4,938	,000
	fr2eve	34,705	3,215	,156	10,794	,000
	sa2eve	59,537	2,394	,262	24,874	,000
	su2eve	-23,023	2,363	-,101	-9,743	,000
	maeve	14,614	4,467	,030	3,272	,001
	tueve	16,776	4,577	,035	3,666	,000
	weeve	14,812	4,490	,030	3,299	,001
	theve	26,744	4,623	,055	5,785	,000
	freve	33,317	5,401	,062	6,168	,000
	saeve	52,881	4,940	,099	10,705	,000
	frnight	-19,306	5,083	-,039	-3,798	,000
	sanight	-12,630	4,614	-,025	-2,738	,006

a Dependent Variable: number of admissions

table 2

Categorizing

As table 2 shows, each moment of performance has a unique effect ('B') on the number of admissions (whether significant or not). In an attempt to simplify all this information, categories of moments of performance were formulated. Each category should lead to approximately the same number of admissions. Therefore, using table 2 as a starting point, the unique effects should be simplified into ranges. These ranges are to be chosen carefully so that each range contains enough unique effects and differs enough from other ranges. The ranges that were applied to formulate these categories are given on page 10 of the report. All moments of performance that are not concluded in the second regression analysis are assigned to the same category as the reference (Monday first afternoon), namely category three.

Testing

A way to check the correctness of the formulated categories is desirable. Therefore the database was split up into two parts: the first 70% containing all data on which the regression analysis is based and the remaining 30% with which the correctness of the categories (that are mainly based on the regression analysis) is tested. Testing the correctness of the categories requires a prediction based on the regression analysis. So each category should lead to a prediction of the number of admissions. This firstly needs the construction of a variable for category. This construction was entered manually using the outcomes of the division of the 37 moments of performance into the six categories. Attempts to automatically assign the moments of performance into the six different categories should be made in the future (for instance by a database manager). At this moment, the division of the moments of performance needs to be made manually after the regression analysis using the ranges as given on page 10 of the report. The variable for category was easily recoded into six different dummy-variables. These dummy-variables were put into a new regression analysis as independent variables (number of admissions as dependent variables). The output of this analysis leads to the predictions. Category three was taken as a reference. Category one and two lead to a lower number of admissions, while category four, five and six lead to a higher number of admissions compared to category three. According to our model, the number of admissions is equal to the number of admissions that are linked to category three plus the deviance of the category the moment of performance is categorized in (see figure 2). This is done for 70% of the data. The number of admissions according to our model are then taken as predictions for the 30% of the data that was not included in the formulation of the categories. These predictions were tested for their correctness using a correlation analysis where the predictions for the number of admissions were correlated with the real number of admissions. This resulted in a correlation of approximately 35% and a proportion of explained variance of 12%. Even thought this correlation is not very strong, methods of improvement are already given in the report (increase of database and a more complete SQI).

Bibliography

- Huizingh, E. *Inleiding SPSS 9.0 voor Windows en data entry*, Schoonhoven (1999).

- Vocht, de A. *Basisboek SPSS 10 voor Windows 98/ME/2000,* Bijleveld (2000)

- NVB & NVF. *Jaarboek 2005,* Young Media Group Netherlands (2005)

- Film Information System Wolff Cinema Group (2004)