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Abstract

A planning system was developed for optimizing the use of different marketing instruments/resources in new newspaper subscription sales at a Dutch newspaper. Various instruments and their daily application are described in relation to the yearly marketing plan, as well as the pertaining constraints. This resulted in a mixed-integer mathematical programming model which yielded an optimal solution that resulted in an improvement of 14% in new subscriptions, at a ten percent savings in annual sales budget. The analytical planning model not only yielded promising results, but also prompted direct marketers of the newspaper to express their reasoning more explicitly, making the annual marketing strategy setting more transparent and objective. The model was well received by management, and would be used as a support tool for sales planning in future years.

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1. Introduction

In this research, a quantitative decision support tool is developed for formalizing/supporting the sales plan of a major newspaper in the Netherlands, thereby adding value to the transformation process of resources into new subscription sales. The editorial staff members of the newspaper work independently of each other. None of any of the departments of the company, nor the board of directors, have any influence on the published content. As such, the sales or advertising department are not in a position to influence the content or appearance of the newspaper as to increase sales or profit. This autonomous position of the editorial staff is deeply rooted in the company, both in its structure and culture. Besides the editorial staff members, there are a number of departments that provide services for the newspaper. The Advertising Department is responsible for the sales of advertising space to both companies and private persons. The Circulation Department, the focal point of this research, is responsible for the marketing and sales of the newspaper. The Printing Department is responsible for the physical production of the newspaper, whereas the Distribution Department makes sure that all newspapers are delivered to the customers each day. The working of the Circulation Department is detailed below.

2. Circulation Department

This is the marketing & sales department for the newspaper, both for single copy sales and subscriptions. Besides marketing & sales, this department is also responsible for customer service and customer administration (including billing and cashing).

2.1 Subscription Sales

Within subscription sales, a direct marketer is responsible for obtaining the required level of subscribers. This can be done either by acquiring new subscribers (starts), or by preventing present subscribers from canceling (stops). New subscribers can directly take up a full subscription, but most of the time a full subscription is preceded by a trial subscription. Everyone with a trial subscription is contacted by Telemarketing salespersons to persuade them to upgrade to a full subscription (conversion call). The percentage of successful conversion calls is called the conversion ratio. Every year marketing writes a marketing plan for the newspaper. This marketing plan comprises an Internal/External analysis, a SWOT analysis, and the proposed strategy for the next year. Based on this marketing plan, the direct marketer can develop the sales plan for the following year. The sales plan translates the strategy of the marketing plan into a tactical plan, indicating the usage of resources (budget) into sales campaigns. It describes which sales instruments (type of sales campaign) will be used, and to what extent, to achieve the targets set by management. This research focuses mainly on those campaigns that yield new trial subscriptions. Actions directed at preventing subscribers from canceling are outside the scope of this study, mainly because of lack of data. The same applies for trial subscriptions that cannot be linked to any campaign, and must therefore be regarded as spontaneous. In creating the sales planning for the following year, the direct marketer is driven mainly by the targets set by management.

Each year is characterized by two important target periods:

In September, the number of subscriptions is measured for all Dutch newspapers by a national newspaper organization, called Cebuco. The figures of the so called "Cebuco-period" are sent to all advertising departments, and form the basis for next year's advertising tariffs. Since

advertising makes up for more than half of a newspaper's income, these Cebuco-ratings are of extreme importance. During this period the planning of sales campaigns is more than just a matter of comparing costs and benefits. A few subscriptions might bring up the newspaper's circulation just enough to invoke a substantial increase in advertising income.

A second important target period for the direct marketer is the end-of-year circulation number. This is merely for internal use, and can be considered his personal target. In order to plan all campaigns for the following year, the direct marketer has to rely heavily on his/her own experience and last year's results. An important tool used comprises the actual conversion ratios obtained from sales campaigns of the last few years for each different marketing instrument during each month of the year. These ratios, combined with strategic views stipulated in the marketing plan, form the basis for the new forecasted conversion ratios per instrument per month. Given the targets and the conversion ratios, the direct marketer can now put together a forecast for next year's sales campaigns, taking into account other constraints, such as budget limitations. The sales plan indicates exactly how many prospects will be targeted through the use of each marketing instrument during each month. It also indicates the cost per instrument and cost per month as the basis for budgeting. Finally, it yields a forecast for the number of new subscriptions per month, and thereby the forecasted circulation numbers per month for the following year.

An advanced planning system for the number of sales actions per period was developed and tested, and is described next.

3. The advanced planning system

Interviews were conducted with the director of the Circulation Department, the marketing & sales manager, and the direct marketer, highlighting a need for a more scientific approach to the sales planning effort. The research application was identified as to produce a model that would yield an optimum mix of marketing instruments in terms of producing the highest number of new subscriptions. Historical data over the last three years were used as a basis for obtaining parameter forecasts for next year's plan.

3.1 Objective Function

Interviews with the direct marketer learned that two possible directions for establishing an objective function could be considered. One would be to maximize the number of subscriptions for the newspaper through optimal use of the available resources. The other direction would be, given a fixed circulation number as target, to minimize the cost for obtaining this target value. As additional subscriptions above target level would be greatly welcomed, the first approach of maximizing the number of new subscriptions within the given resource constraints was decided upon as the objective function.

3.2 Decision Variables

After a few interviews it was concluded to use the number of sales actions per period, measured in prospects targeted, as decision variables of the model. This translates into individual marketing instruments, each identified by a two letter-combination and period number (month), as is illustrated in appendix 1.

3.3 Marketing instruments

Individual marketing instruments available to the direct marketer for obtaining new subscriptions will be described in detail. The effectiveness of the marketing instrument is measured by the number of new subscribers per number of prospects targeted (if individual prospects can be targeted), or the number of new subscribers per single campaign. This parameter will be called the Effectiveness Coefficient, and varies for each instrument and period (month). Although the Effectiveness Coefficient eventually yields the number of new full subscriptions, it is actually made up of a combination of the number of trial subscriptions and the conversion ratio (which also differs for each instrument and period). The effectiveness coefficients are given in appendix 1.

The different marketing instruments are detailed below.

3.3.1 House-To-House

This is the delivery of folders or brochures to houses within a specified area. Folders are distributed to every house, or distributed randomly within the area. It is a rather indiscriminate instrument, since all houses in this area will be targeted regardless of the fact whether the occupant may already be a present subscriber. Non-readers and people indicating that they do not wish to receive any advertising mail, will also be targeted. Furthermore, these folders are not personally addressed, so their attention value is much lower in comparison to personalized mail. As such, the effectiveness coefficient for this instrument is very low. On the other hand, it is one of the least expensive instruments. House-to-house can be subdivided into two separate groups: folders and mailpacks. Folders are delivered as a separate item, while mailpacks contain offers from many

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companies, so the attention value of a folder is much higher in comparison to a mailpack. With folders the direct marketer has the possibility to define the exact number of houses to be targeted, while mailpacks always have a fixed circulation number, often several hundreds of thousands.

3.3.2 Telemarketing

Telemarketing conducts sales by telephone. People are called up by telemarketers (from a specialized external company) with an offer for a subscription. The attention value is very high since all prospects are targeted personally. It has the highest effectiveness coefficient, but is also the most expensive instrument. Telemarketing can be subdivided into three different groups, depending on the type of prospects targeted for the campaign, whereby each prospect group is characterized by a different effectiveness coefficient:

Cold	Prospects which are randomly selected within a specified area. There is no personal relation between the prospect and the company. The only means of selection is through demographical analysis with the aid of zip code-oriented marketing tools.
Suspect	These are prospects of which some personal information is known, giving them a higher probability to become a customer. For instance, people who have filled out a questionnaire once indicating that they are newspaper readers.

Ex-Cust	This is the group of prospects that have recently been a subscriber to the newspaper, and have cancelled their subscription within the last two years. This group will yield the highest effectiveness coefficient of the three subgroups.

3.3.3 Direct mail

With direct mail, a folder or brochure with an offer for a subscription is sent to a prospect through personalized mail. The attention value is high since it is sent as addressed mail. Sometimes this folder can be accompanied by a personalized letter, thereby increasing the attention value. Direct mail as marketing instrument can also be subdivided into similar subgroups, similarly to telemarketing.

3.3.4 Media

The media instrument is the advertising in other (written) media, for example in magazines. Often this is done in the form of a barter agreement, where the newspaper is allowed to advertise free of charge in the magazine, while the magazine gets free advertising space in the newspaper. Media can be divided into two separate groups:

Coupon	An advertisement will be placed in the magazine with a coupon to be sent in by the prospect.
Insert	This is a folder that is inserted into the magazine. There is no advertisement in the magazine to accompany the insert.

3.3.5 Student diary

Since students are one of the main target groups of the newspaper, each year a special student diary is produced which is distributed freely among students. In this diary there are response coupons for the students to send in for a (trial) subscription.

3.3.6 Direct response media

This instrument indicates the use of electronic mass communication media with the possibility of a direct response by the prospect. This can be advertising on TV or radio, in which the commercial spot usually displays a toll-free telephone number. At the time of the study not enough data was available on the use the Internet, resulting in the two direct response media TV and Radio.

The resulting decision variables, with their respective efficiency coefficients, are listed in appendix 1.

3.4 Constraints

The constraints applying to the advanced planning model can be categorized as financial-, physical-, market-, or periodical constraints. All figures pertaining to the newspaper were transformed for the sake of confidentiality.

Financial Defined as budgetary constraints, both in total amount of money available to the direct marketer for all sales campaigns, as well as in the appropriation of funds

among the different instruments. The total budget available to the direct marketer amounts to Euro 1.364.000,- for the entire year for all instruments, except for Direct Response instruments which have a separate budget.

Physical The physical restriction is determined by the size of the captive market. This limit could be the total number of households in the targeted area or the total number of ex-customers available. These physical limits are fixed and exogenous, and can therefore not be influenced by the direct marketer. For example, student diaries can only be used as a marketing instrument in the month of august (prior to the school year), with a cap of 320.000 diaries.

Market Determined as both upper and lower limits on the number of prospects to be captured, set by a required minimum level of advertising (brand awareness) or fear of overkill. To establish a general presence in the newspaper market, a certain minimum number of contact moments is required. A contact moment is each time a prospect is reminded of the existence of the newspaper with a possibility to subscribe through one of the marketing instruments. The minimum number of contact moments per month is 500.000 with an exception for the months June, July and September, when there is no minimum presence required. To avoid saturation in the market and possible irritation by prospects, there is a ceiling of 3.000.000 contact moments per month.

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Periodical The main periodical restriction is defined as the Cebuco-period (August) in which a minimum number of new subscribers must be achieved. In contrast, the summer months (June and July) are campaign-free. Other periods may be linked to special campaigns or events.

The individual constraints for planning purposes are outlined below.

3.4.1 House folders

This is the most predominant instrument for gaining new subscribers. Minimum and maximum expenditures for this instrument were set at Euro 454,500 and Euro 682,000, respectively. The cost for this instrument is Euro 0.068 per prospect targeted. The maximum number of contact moments is set at 10,000,000 annually, with the additional restriction of no more than 2,000,000 contact moments per month, with the exception of the June and July. The newspaper under study is in the Dutch language and has a national character, and cannot be sold outside the country, unless for a very small number of Dutch people living abroad. The only option to increase the number of prospective households would be to target a certain household more than once. As people will not buy more than one copy of the same newspaper, this option is not valid. It may apply to companies but these are not targeted by these campaigns. The maximum number of households to be captured is therefore estimated at 2,000,000 per month. Two months, January and August, are very important for house-to-house folder distribution. January is an important month because many people do not renew subscriptions in December, so there is a great number of people available without a newspaper that can be potentially captured. During this period many people switch newspapers, so it is very important to

put pressure on the market in order not to lose market share. Therefore, the minimum number of house to house folders to be distributed in January is set at 1,500,000. August is important for the Cebuco counting held in September. The minimum number of folders to be distributed in August is set at 1,500,000 as well. Efficiency coefficients for mailpacks are set at roughly one-third of the level for folder distribution.

3.4.2 House-to-house mailpack

Mailpack campaigns have a fixed number of prospects targeted for a fixed price. The cost for a mailpack amounts to Euro 7,955 per campaign of 500,000 prospects. The only periodic restriction for mailpacks is that no campaigns are held during the months of June and July. Mailpacks are distributed by an external direct mail company, and their circulation number is fixed at 500,000, setting the physical restriction. The total number of mailpack campaigns should be limited to three or fewer per year. Because of the fixed circulation number (beyond the control of the direct marketer), each of these mailpack campaigns will target 500,000 prospects. Besides the annual restriction, there is also the restriction that such a campaign can only be held once each quarter. There is no limitation on which month of the quarter it can be used as a marketing instrument, making it possible to plan it in two consecutive months.

3.4.3 Telemarketing

The maximum budget available for this instrument amounts to Euro 159,100, with a price per telephone conversation of Euro 1.23. An annual limit of 150,000 applies in regard to ex-customers targeted. The restriction of no campaigns during June and July also applies

to telemarketing. The Cebuco-period calls for a minimum limit of 90,000 telephone calls for August for cold calling, with a maximum of 110,000. For ex-customers a minimum limit of 80,000 telephone calls applies in August. During the problem formulation, the sub-division of prospects into a suspect group caused problems while not adding any merits. Since cold addresses are already selected from the total address database using advanced geographical and demographical tools, the resulting addresses can be considered closer to suspect than cold. These addresses cannot be further refined into the suspect status. Databases with suspects are sometimes bought for special campaigns, but in such low numbers that they can be ignored for this model. The differences in effectiveness coefficients between real suspects and specially selected cold addresses are so modest that no distinction can be made between the two groups, and therefore it has no benefits to treat them as separate groups. Consequently the instrument of suspect in Telemarketing was removed from the model.

3.4.4 Direct mail

Direct mail has budgetary limitations of Euro 90,900 for cold addresses and Euro 45,460 for ex-customers. Cost per mail ranges from Euro 0.45 for ex-customers to Euro 0.55 for cold addresses. The maximum number of ex-customers is estimated at 150,000 per year. The only periodical restrictions pertaining to direct mail, both cold addresses and ex-customers, state that no campaigns should be held during the months of June and July. For similar reasons as stated earlier under telemarketing, the instrument of *direct mail suspect* will be eliminated from the model.

3.4.5 Media

Since practically all media campaigns are bartered, there are no extra costs for the circulation company. This applies to both inserts and coupons. Very few campaigns were conducted in the past, so hardly any historical data exist. Furthermore, most media campaigns are based upon barter agreements with the magazine publishers. Opportunities for conducting such campaigns seem to occur in a random fashion. Since these campaigns can neither be planned nor forecasted as to their effectiveness, they will not be taken into account for the final model. Because of the low number of new subscribers they are expected to yield, the impact on the validity of the model will be marginal, if not negligible.

3.4.6 Student diary

Advertising costs amount to Euro 0.045 per diary, with a limit of 320,000 units, the targeted college population in the Netherlands. This marketing instrument only applies in August, one month prior to the start of the academic year.

3.4.7 Direct response

This is a new marketing instrument to be tested for the first time, with a budget of Euro 409,100 for TV advertising, with a cost of Euro 2,500 per transmission.

4. Evaluation of Results

The resulting advanced planning system was formulated as a mixed-integer linear programming model with 85 decision variables and 67 constraints, and was solved using PC-PROG sofware (Quantitative Management Software, Amsterdam). This software possesses an integrated ASCII word-processor for data entry, which proved very useful when discussing the model with the end users. Table 1 shows the resulting optimal number of contact moments per marketing instrument per month, while Table 2 displays the resulting optimal number of new subscriptions per instrument per month.

The following legend is used: HTH = house-to-house, TM = telemarketing, DM = direct marketing, DR = direct response media.

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Table 1: Number of contact moments per marketing instrument per month

Month	Marketing Instrument							
	HTH-folder	HTH-mail	TM-cold	TM-ex cust	DM-cold	DM- ex cust	student diary	DR-TV/Radio
January	2,000,000	0	19,630	70,000	166,67	83,333	0	0
February	1,000,164	0	0	0	0	0	0	0
March	0	1	0	0	0	0	0	0
April	0	1	0	0	0	0	0	0
May	499,836	0	0	0	0	0	0	164
June	0	0	0	0	0	0	0	0
July	0	0	0	0	0	0	0	0
August	2,000,000	0	110,000	80,000	0	0	320,000	0
September	2,000,000	0	0	0	0	0	0	0
October	2,000,000	0	0	0	0	0	0	0
November	0	1	0	0	0	0	0	0
December	500,000	0	0	0	0	0	0	0

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Table 2: Number of new subscriptions per marketing instrument per month

Month	Marketing Instrument							
	HTH-folder	HTH-mail	TM-cold	TM-ex cust	DM-cold	DM- ex cust	student diary	DR-TV/Radio
January	1,200	0	137	3,500	667	583	0	0
February	500	0	0	0	0	0	0	0
March	0	850	0	0	0	0	0	0
April	0	850	0	0	0	0	0	0
May	200	0	0	0	0	0	0	574
June	0	0	0	0	0	0	0	0
July	0	0	0	0	0	0	0	0
August	1.600	0	880	1,600	0	0	640	0
September	1,200	0	0	0	0	0	0	0
October	1,200	0	0	0	0	0	0	0
November	0	850	0	0	0	0	0	0
December	250	0	0	0	0	0	0	0

The maximum number of new subscriptions was found to be 17,280, with an associated cost of just above 1.59 million Euro, resulting in savings of 10% of the available sales budget. The current sales plan indicated a total of about 15,100 new subscriptions for the entire year, whereas the model yielded 17,280 new subscriptions, or an improvement of over 14%. Besides yielding a sound base on which to build the annual sales plan, the research project also provided for a more objective analytical approach to the yearly sales planning/budgeting sequence. Because

everything needs to be taken into account and defined into a set of numerical data and logical expressions, the direct marketers are now forced to explicitly state their reasoning process. The model, therefore, was deemed useful, and would be implemented as a support tool for sales planning in future years.

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Appendix l: Decision Variables and Effectiveness Coefficients

Marketing Instrument (effectiveness coefficient)								
Month	HTH-folder	HTH-mail	TM-cold	TM-ex cust	DM-cold	DM- ex cust	student diary	DR-TV
January	HFI(0.06)	HM1(0.02)	TCI(0.7)	TEl(5.0)	DCI(0.4)	DEl(0.7)	SDI	DTI(3.5)
February	HF2(0.05)	HM2(0.02)	TC2(0.6)	TE2(4.0)	DC2(0.4)	DE2(0.6)	SD2	DT2(3.5)
March	HF3(0.05)	HM3(0.015)	TC3(0.6)	TE3(4.0)	DC3(0.3)	DE3(0.6)	SD3	DT3(3.5)
April	HF4(0.05)	HM4(0.015)	TC4(0.6)	TE4(3.0)	DC4(0.2)	DE4(0.5)	SD4	DT4(3.5)
May	HF5(0.04)	HM5(0.013)	TC5(0.6)	TE5(3.0)	DC5(0.2)	DE5(0.5)	SD5	DTS(3.5)
June	HF6(0.03)	HM6(0.01)	TC6(0.6)	TE6(2.5)	DC6(0.1)	DE6(0.5)	SD6	DT6(3.5)
July	HF7(0.03)	HM7(0.01)	TC7(0.6)	TE7(2.5)	DC7(0.1)	DE7(0.5)	SD7	DT7(3.5)
August	HF8(0.08)	HM8(0.023)	TC8(0.8)	TE8(2.0)	DC8(0.4)	DE8(0.7)	SD8(0.2)	DT8(3.5)
September	HF9(0.06)	HM9(0.02)	TC9(0.7)	TE9(2.0)	DC9(0.4)	DE9(0.5)	SD9	DT9(3.5)
October	HF10(0.06)	HM10(0.02)	TC10(0.6)	TE10(2.0)	DC10(0.3)	DE10(0.5)	SD10	DT10(3.5)
November	HF11(0.05)	HM11(0.015)	TC11(0.6)	TE11(2.0)	DC11(0.2)	DE11(0.5)	SD11	DT11(3.5)
December	HF12(0.05)	HM12(0.015)	TC12(0.6)	TE12(2.0)	DC12(0.2)	DE12(0.5)	SD12	DT12(3.5)

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