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THE MODEL OF DYNAMIC SIMULATION OF BUSINESS PLAN APPLIED IN CHEMOSVIT FÓLIE A. S.

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Abstract:
The model described in the paper is created based on detailed analysis of historical data of sales for specific motives, products, assortment groups for individual plants (customers) what allows to precise the prognosis of their future demand and resulting requirements for inputs into production, load of individual production nodes, investments needs, performance evaluation of sales department as well as individual sellers, revenue estimation. Moreover, the proposed model takes into account the job sizes, their number and/or frequency of occurrence and specific signs of purchasing behaviour typical for individual customers (e.g. seasonal nature).

Key words:
Business plan, dynamic model, forecasting, capacity potential and capacity demands, sales

INTRODUCTION

When proposing elimination for limitations of present business plan, firstly, the list of parameters - coefficients is prepared of those the estimated and calculated values of which create a more accurate picture of demands and modification of ordering process of customers as well as subsequent production. By determination the function relations of new parameters and by permanent and ongoing automatic comparison and verification of facts and assumptions it is possible to achieve long-term stabile prediction of status in capacity demands for individual customers and to resolve possible conflicts in advance. Using a dynamic modelling for

incoming demands and tenders a possibility occur to precise the decision making process significantly for both the trade management and the production [6], [11].

Setting of necessary model parameters is based on analyses and knowledge about orders from previous periods (historic data series from the periods N-1 and N-2) as well as on expert knowledge of personnel (heuristics) serving for individual customers. For some orders, information having a significant impact is that about contractual relationship of the customer with third parties, usually multiple stores, which the customer is undertaken to comply with and such information is unavailable currently[7], [8].

For preparation the dynamic model of annual business plan, the customer demand is needed to be understood and defined. For the business plan preparation, time of production is significant for particular products, assortments and motives and thus it is the case of job-order production [2].

Majority of customers are the producers of food and non-food products. In order to pack their products, the customers require particular motives – designs, specific for each company with unique material composition. Minority of customers are the trade enterprises which sale the goods further to a particular producer with added value of communication, re-storing and financing [1], [12].

For defining parameters, basic information is a destination place of delivery – usually production plant of the customer which needs to be long-term supplied on the ongoing and flexible basis during the contractual relationship. Usually, in the particular plant, the contractual share of one supplier is determined, e.g. 30 to 70 % of annual consumption [1].

The motives – designs of the customers are placed on the market. From the long-term perspective, the motives could be divided to core main motives with frequent occurrence of orders, e.g. 6 – 10 times per year and big volume, less often motives such as also mutation for various countries with less consumption and one-time promotion motives for a specific occasion such as sport, season motives, e.g. for Christmas market. The motives are divided by marketing – design to the own trademarks and the exterior – private marks, e.g. for big trade networks. This factor may significantly affect repeatability and size of the orders [1], [3].

The customer´s products – are their basic products that are produced in their plant as well as packed on installed packaging lines and that have usually default defined composition and long-term forecastable sales including seasonability effect [5].

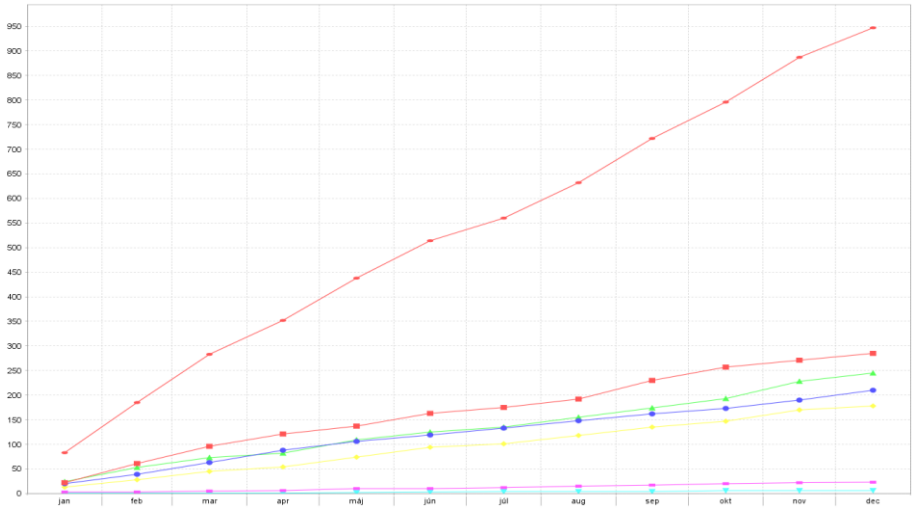

Fig. 1 *Example of visualization of the number of orders per year, their size for the particular segment and the customer. (Corporate Documents, 2017)*

The parameter also includes innovations and modifications in motives in the course of the year defined by the customer in the form of order for modification in motive design, establishment – origination of new motives but also by information about deletion – removal of motives, if appropriate [4].

The parameter is also information achieved at awarding the tenders. Here, in the phase of demand, information about the number of motives, assortment, assumed size of order on a quarterly and annual basis is achieved [10], [13].

1. TWO LEVELS OF THE DYNAMIC BUSINESS MODEL PROPOSAL

The 1st level – extended annual plan, precising of planning parameters according to individual plants.

The 2nd level – detailed dynamic identification and modelling of parameters of particular jobs

1.1 The 1st level – extended annual plan, precising of planning parameters according to individual plants

The level consists of three basic phases. The first phase is preparation of extended annual plan for the customer in the form of Table 2, the second phase is checking of the plan on behalf of all customers from the standpoint of capacity and the third phase is quarterly dynamic revision of annual plan according to the plants.

The 1st phase: Preparation of extended annual plan

The annual level of the plan is prepared for each customer so that it covers all contracted and long-term customers with a part of volume also for non-specific future customers.

The annual level of the customer´s plan is completed manually by anticipated demands for seasonality of requirements resulting from information about nature of customer´s needs in previous period from contracted and planned modifications in the particular year.

The annual interval of planning is examined in practice and proper for calculations but at decisions about achievement of new volume or new plant, the application and verification tests are performed, usually full starting-up lasts for ca. 1 year. Similarly, at termination of cooperation in a particular plant and transition to other supplier, suppression of production is held ca 1 year.

Possibility to create value of plan from the standpoint of finance is very important. In the annual plan, for estimation, the value of unit price of the technical unit from the previous year is used with application of particular total known conditions and modifications resulting from price modules for the actual year.

The seasonality coefficient is described by nature of the segment wherein the customer acts and is achieved from the historical data. In the case of new customer, the coefficient of other typical customer of standard segment is used.

The coefficient of average intensity of node utilization by the particular customer is determined based on the data from the plant´s information system and the values from previous year are applied for the initial setting.

In the case, when the customer places the order in other measurement unit such as M2, a calculation according to the historical coefficient for each customer individually is used.

In the case of extended annual plan, the core production nodes are considered according to the actual assortment of the customer. In the future, when new technological equipment is

purchased or at critical capacity demand, other or a new important node is added into the table [8].

Annual demand of the particular plant is planned in the technical units for each planned assortment. Expressly, the assortment specifies the production nodes through which it passes during the production process. The assortment of the actual plan excludes specific thicknesses and composition of semi-finished products, working widths of motives as well as definition of nature of the orders.

The information system comprises a record for each existing motive about the plant to which the supplies are executed.

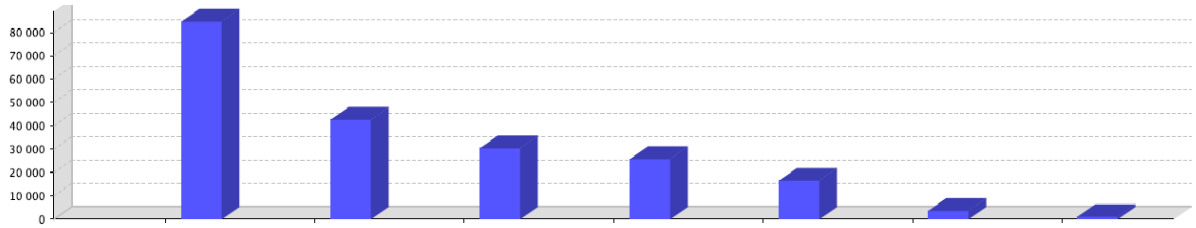

Fig. 2 *Example of the plan for individual assortments demand for the selected customer and plant, in technical units per year (Corporate Documents, 2017)*

Tab. 1 *Example – parameters of the extended model of the business plan of the enterprise*

Annual plan for needs of customers manufacturing plants	Totally: /MT/	Average order size /KG/	Number of designs /pieces/ Single/repeated	Number of orders /items	Average of product thickness /um/	Average of product width /mm/	Avegarage number of colors //	Coeficient of plan modification %	Node1 Printing/NH/	Node2 Printing.2 /NH/	Node3 Lamination /NH/	Node 4 Basic film prod. /NH/
Annual matrix of demands and resources:	600 MT							Coeficient of planned volume – inc./decreas.	250 MT	20 MT	580 MT	500 MT
Product 1 -plan	80 MT	1000	30	80	42	1110	7		40	0	80	0
Quarter 1.	V2		26 / 1	20				20	V1	V1	V1	V1
Quarter 2.	V2		…			…		20	V1	V1	V1	V1
Quarter 3.	V2		…			…		23	V1	V1	V1	V1
Quarter 4.	V2		…			…		27	V1	V1	V1	V1
Product 2 –plan												
Quarter…												
Product … –plan												
Quarter…												
Average capacity utilization of plant /node /NH/MT/									5,2	4,5	3,1	3,7
Annual capacity demand /NH/									…	…	…	…

The annual demand plan of unique assortment for the particular plant could be defined on the new level of details referring to the quality by the statistical average of thickness and width as well as the number of colours that are necessary for re-calculation of estimation of needed capacity of the node.

From the standpoint of quantity, the annual demand plan of unique assortment for the particular plan may be defined by the number and average size of orders. The order size in this level is modelled by assigning of pre-determined intervals in the technical units.

The parameters of plant´s planning for this level are mentioned in the Tab. 3, [14], [3].

The 2nd phase: Verification of extended annual plan from the standpoint of capacity.

The tables of customer´s annual plans are used for creation the sum of planned quarterly and annual values of capacities in NH for all customers.

Tab. 2 *Annual planned demand for capacity of individual nodes and customers*

	Node 1 /NH/	Node 2 /NH/	...
Customer 1	NH_{11}	NH_{21}	
Customer 2	NH_{12}	NH_{22}	
...	...	...	
Total demand per year	$\sum NHZ_{1i}$	$\sum NH_{2i}$	

NH_{ij} – capacity demand of customer "j" in the node "i"

These values are compared with the value of annual available time of individual production nodes.

Tab. 3 *Annual planned availability /capacity/ of individual production nodes*

	Node 1 /NH/	Node 2 /NH/	...
Machine 1	NH_{11}	NH_{21}	
Machine 2	NH_{12}	NH_{22}	
...			
Total capacity per year	$\sum NH_{1j}$	$\sum NH_{2j}$	

NHVij – capacity (production capacity) of the machine "j" in the node "i"

The comparison results in information confirming feasibility of the business plan. In the case of infeasibility, an early need for taking proper measures is occurred. Within this item, a set of proper measures needs to be proposed as well as conditions of their application and thus an early matching between capacity demands and capacity potential of production is provided.

The 3rd phase: Dynamic re-evaluation of annual business plan:

Quarterly, the Table 2 is completed with the actual data. Re-evaluation comprises the following:

1. Calculation of achievements in tons and comparison with the plan. After calculation, a decision is taken about e.g. transfer – modification of new needed capacity reservation for new planned period of quarter.

2. Implementation of new facts achieved during the on-going trade relation and contracting into the table of volume – coefficient of planned modification.

3. New calculation of following quarter volumes in the technical units and consequently the node capacities

4. Review of capacity balance of following quarters in the core nodes

5. Application of planned capacity values for the customers and nodes into the program for creation of timetables, aggregated planning, (Tab. 2).

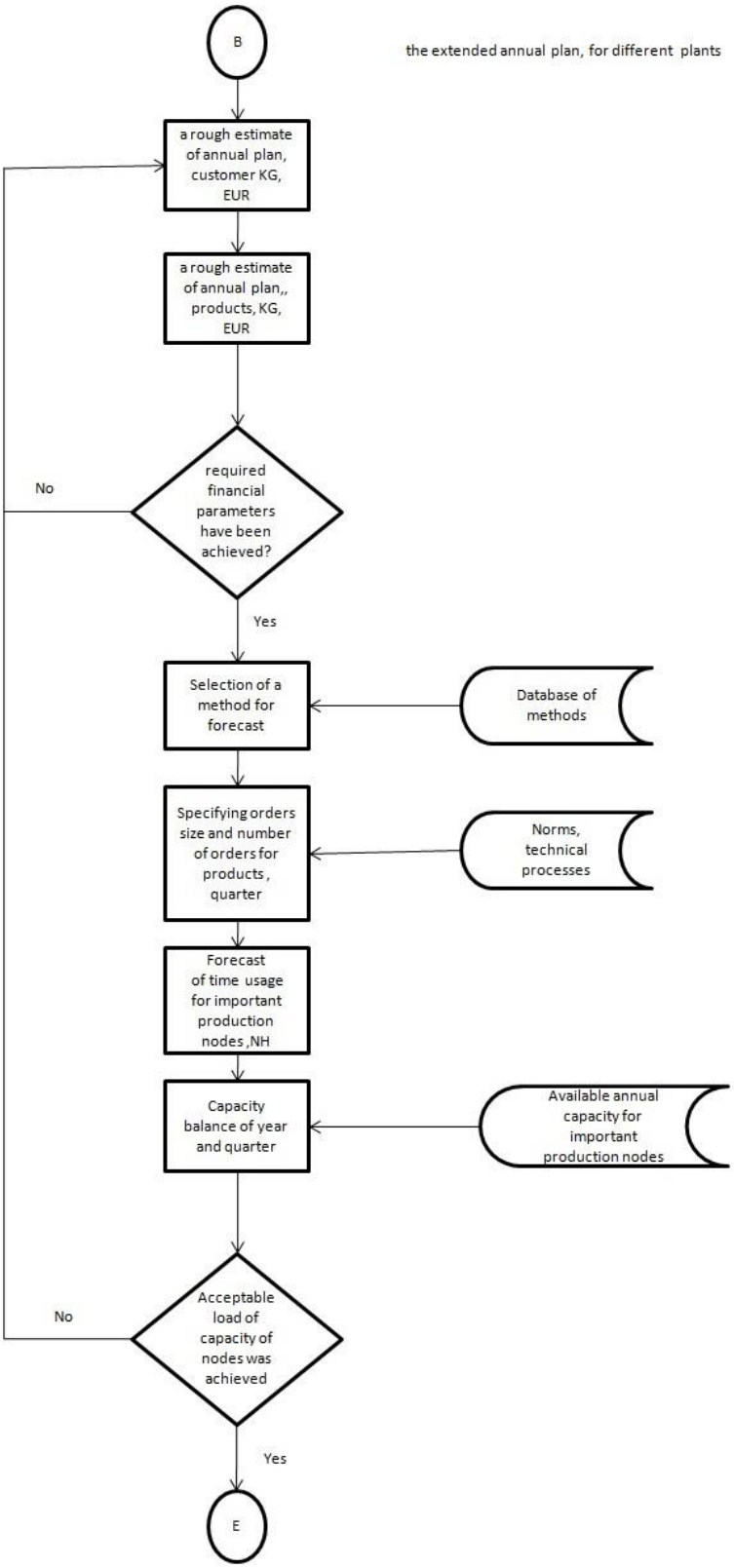

Fig. 1 *Flow chart of 1st level of the dynamic plan – the extended annual plan*

1.2 The 2nd level – detailed dynamic monitoring of parameters of specific jobs

This level comprises four basic phases. The first phase comprises defining and completing the parameters of each motive in order to precise the possibilities for forecasting, the second phase comprises creation of extended annual plan of motives for a plant in the form of the Table 6, the third phase comprises the quarterly dynamic re-evaluation of needs of individual motives, the fourth phase comprises calculation of prognosis and transfer of achieved assortment parameters into the plant´s annual Table 2 and application into the business plan for the following period.

The 1st phase: completion of new parameters

When modelling the needs and orders of customers, it is necessary to know the factors and parameters which are relevant. Many of them are nowadays included in the information system such as the assortment, thickness, picture width, production width, number of colours, circumference of rolls, etc. However, many significant data are not entered in the information system. By their definition, filling in and analysis, a possibility for individual creation of a view on the demands of each plant of the customer, segment and status change in the market is thus allowed.

Forecasting of occurrence of the individual motive during the year provides also relevant initial data for optimization of printing plates production and archiving, for determination of demands for semi-finished product demands, for precision of needs for capacities of nodes for specific assortments feasible only on specific – listed technological equipment within one node.

For need of detailed planning for customer demands, the data about each existing and new motive are completed with new parameters achieved by analysis of demands, from defined inquiries and tenders:

- the type of customer´s product, a classification code for the particular plant is prepared
- nature of design – own trade mark, mark produced for other distributor such as a multiple store, own marks have higher exactness expected and assumption of repeatability, a classification code of own marks and classification code of multiple store are prepared according to this nature
- identification of the core products
- a field is created for assumed annual number of orders and their size
- a field is created for identification of motive nature from the standpoint of repeatability, forecasted, non-forecasted – samples, promotion one-time sales,
- a filed is created for the motive seasonability nature – a classification code
- for changed number of motive, a link with the previous number is created in order to keep forecasting possibility

The 2nd phase: preparation of the annual table of motives

In this phase, a list of motives with values of all set criteria is prepared, actual parameters of assortment for a quarter are automatically calculated

Tab. 4 *Real annual orders and proposed demand and/or forecast of individual motives*

Plant summary	Individual and special identification parameters for each ordered job	1 Quarter Number and size of orders	2 Quarter Number and size of orders	3 Quarter Number and size of orders	4 Quarter Number and size of orders	Annual planned order size /KG/	Annual planned number of orders	Average width	Average of thickness
Job 1									
Job 2									
…									
Average for product:									
Number of individual values width, thickness									
Summary for product									

The 3rd phase: quarter dynamic forecasting of motives

In this phase, the number of repetitions and size of orders are compared and evaluated against the planned value and accordingly the value is changed.

The 4th phase: calculation of prognosis

In this phase, expected number and size of orders is prepared using modelling formula of motive planning, then it is divided for individual quarters and quantity and time values the assortment and of the plant are calculated according to the Table 3. For modelling, various filters according to parameters in the column 2 are properly applied.

After assessment, the values are transferred into the Table 2 where they are used for the new quarter forecast.

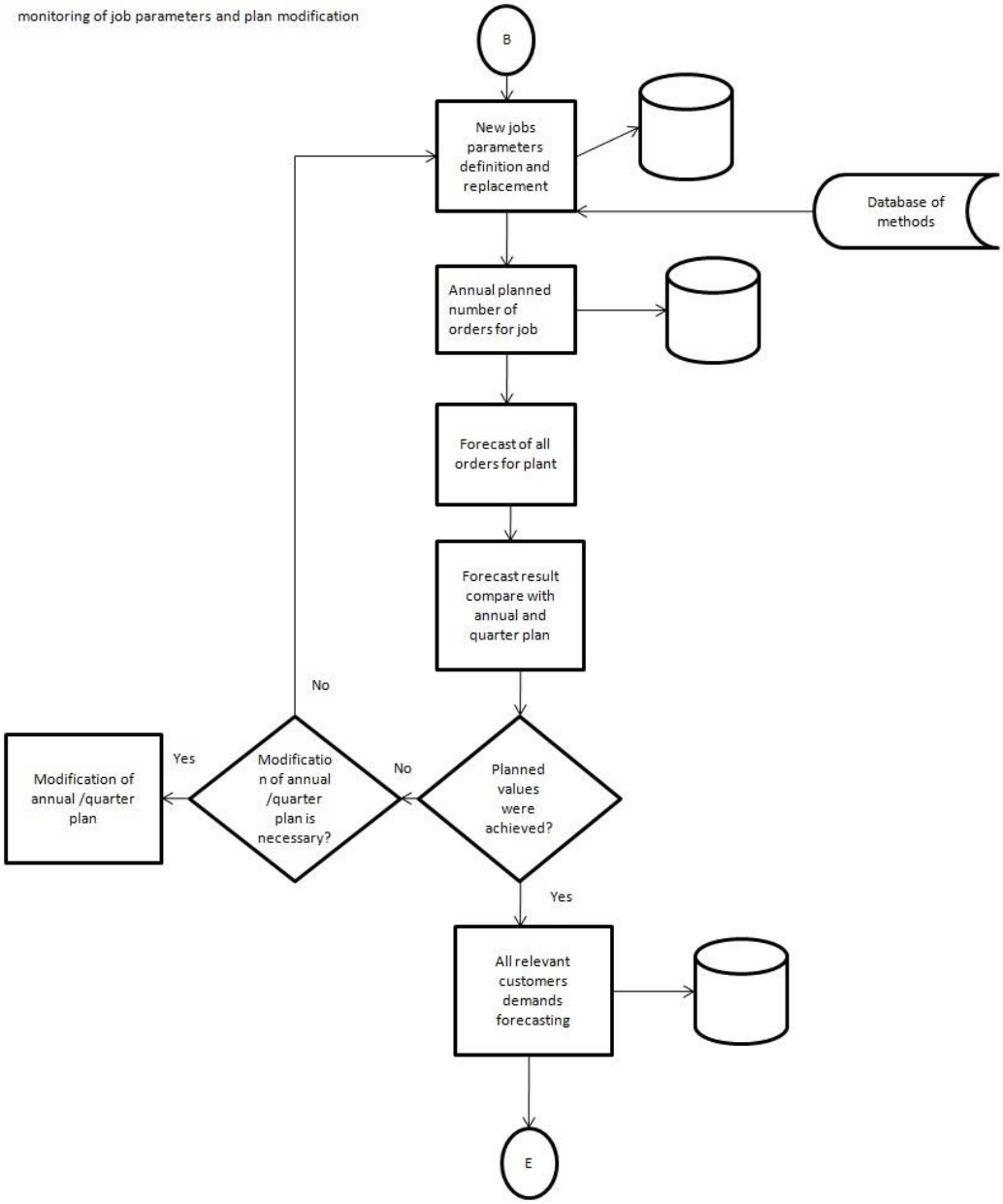

Fig. 2 *Flow chart of 2nd level of the dynamic plan – monitoring of job parameters and plan modification*

CONCLUSIONS

The main contribution of the article – the proposed model – is replacement of static method for business plan preparation which is based only on one-time estimation of total assumed volume of future sales for the particular customer by a dynamic model. This model comes from an idea that for the enterprise is not enough to know only the total future volume of sales for the customers or assortment groups but also to analyse in details behaviour of individual customers in individual assortments up to the level of motives. This is because the capacity load but also a need of individual inputs into the production process depend also on the job size, frequency of job occurrence, assortment comprising its specific thickness, width, colour, preparation and termination periods, non-linear relation between the total volume and

the capacity demand resulting from its implementation. Dynamics of the model lies also in the rolling re-calculation of the model during the year such as in the quarterly periods, incorporation of capacity changes from the producer´s party, modifications of ordered quantities according to the results of tenders in the customers´ companies as well as implementation of new products. Active controlling and correction of the business plan during the year in dependence on changes and development of customer´s demand and conditions on the market. Active control of portfolio based on the data from individual levels of the model represents also a possibility to propose various cost-saving projects, optimized purchases for the customer what becomes a significant added value. The designed model allows also creation of the set of measured and evaluated parameters of sales as a base for evaluation of performance of the complete department and individual sellers – implementation of motivating system in the future. Such designed model provides the outputs for investments, calculation of incomes, ordering the materials with prolonged delivery cycle, planning the production centres such as that for rotogravure roller production and it is a real input for annual production planning.

Moreover, the proposed model with using data export for analysis into proper visualization software represents a large base of the data with the high information value that are unavailable at present and/or a proper tool is missing to display and to update.

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