Market Dynamics for Decision Support in Marketing

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Abstract

This article deals with issues related to system dynamics modelling of market structures from a company's viewpoint. It is focused not only on 'traditional' system dynamics approach, but also on broader perspective - overcoming far too high generality of known SD market models, better intelligibility for marketing managers (using familiar marketing terms) and techniques of working with relevant data, both internal and external mainly from marketing research.

Introduction

One of the dreams most marketing managers, researchers and regulation authorities probably have is to better understand dynamic behaviour of various market structures. These structures are complex in their nature which means that they contain many complex social characteristics such as delays, feedbacks, nonlinear relations etc. So, appropriate tools, models and methods have to be developed in order to help explain market dynamics and to support critical decisions and policy design of these target groups.

It is well proven that system dynamic models are recommended to be used as helpful tools in the sense of policy testing (Sterman 2000), but their integration into marketing information systems is not so common yet (Mildeova 2004, 2005). The reasons can be of various types – from our experience it can be caused by language used in these models (sometimes not familiar with common marketing terms), their too high generality and a lack of real data interconnection.

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It is also inconvenient and frustrating for some marketing managers to work with too many models of various problems, so we need to broaden perspective of using system dynamics models in this particular area to justify their needs and try to find a balance between generality, simplicity and decision support capabilities for real world problems.

In order to successfully implement the system dynamics model in this area, it is also important to understand the current situation of marketing management. As ICT develops, many companies are disposing of their enormous internal databases revealing customer behaviour, company processes, data from business intelligence or marketing research. Consequently, companies are trying to convert the data to more practically used forms of information. And this process which is more or less successful is usually supported by using spreadsheet calculators, statistics tools and data mining.

This analysis is not going to address the drawbacks of these tools. But rather it is going to consider the obstacles of potentially useful system dynamics approaches that may be responsible for impeding of system dynamics usage expansion comparing to these tools.

Another goal of this analysis is to try to illustrate some possible solution of the problems outlined before on, for the present, an in-progress concept of behavioural model (based on the Czech Science Foundation within grant project "System Dynamics Theory And Market Structures", number GACR 402/05/0502). This model should work at the end together with its implementation methodology as a guide for implementation of customized market model into marketing information system of a specific company.

Assumptions and inputs

Our work based on market structures follows the theoretical knowledge within the best known practises of marketing (e.g. Kotler 1970, Kotler 2003, Smith – Fletcher 2001 etc.). Subsequently, inspiration has been drawn from relevant system dynamic works (Sterman 2000, Hines 2000). Apart from some theoretical resources all aspects were discussed with several marketing experts.

Comparing theoretical issues with practical experience resulted in several significant problems. The main problem was discordance between marketing practices and system dynamics models, especially in connection with market segmentation. The dynamic models used are very often too general, using only one common type of behaviour that concentrates only on average customer. In addition, these models do not differentiate between the product image (perception of product values) and the product itself (its physical attributes). The difference may be of a great significance especially in specific situations when the wider experience of product use on market is not available. Also, in many situations advertising effects cannot be generalised because there is no clear relation between the incoming amount of money and the final advertising effect on the consumer. Nonetheless, competition effects are to be dealt with similarly.

Also, the government institutions can affect many of these factors. The government can use tools such as advertisement limitations, rising excise duties, consumer taxes or VAT, support of education of consumers etc. (used widely in tobacco and alcoholic beverages markets) and creates a special social environment. Questions of public goods or merit goods have also been under examination (Nemcova – Larcon 1998).

Another story is the operationalization of model variables and their relation to the information sources that a company can use. For example: data mining is based on such a scheme that works with already existing or easily obtained data. It is important that also the system dynamics models can be continually updated with data relevant for specific customers. The data usually reflect a company's internal information resources (ERP, marketing information system, marketing decision support system) or specific marketing research – this area suffers a significant shortage of system dynamics approach. All this reinforces the necessity to integrate these models into marketing information systems and develop proper techniques of using them.

According to our experience these factors discourage marketing experts from using system dynamics models because the nodal points, analogies and possible benefits are not clearly seen.

Behavioural market model from a company's viewpoint

Designed models and their techniques of use should help to answer the following questions:

1. From the structural point of view what are the significant differences between different types of markets? E.g. markets of durables, FMCG (Fast Moving Consumer Goods), services etc.
2. How to take into account the most important effects that influence the consumer? E.g. advertising effects in various stages of purchase process, effect of purchase situation (POS/POP), gained experience, word of mouth etc.?
3. From the segmentation and market shares point of view, how can the market behaviour be affected?
4. How to create a model that is capable of testing different marketing strategies and consistency of the marketing mix in relation to consumers/customers and competitors?
5. How the model and key variables can be interconnected with various information sources and marketing research in such a way that settings are updated continually according to recently obtained data so the testing of different scenarios is possible?

When analysing the functions of individual market structures, three basic types have been chosen according to their product portfolios – markets with fast moving consumer goods (FMCG), durable-product markets, and service markets. The estimated time scope is about three years (at first, we plan to continue with longer simulation time).

The most important aspects that have sprung from the conceptual phase of modeling these market structures (especially taking into account markets with end user consumers and FMCG) are as follows:

- *The needs of end consumers* – these needs (and also consumers) are not in the majority of cases fully homogeneous. There is often a range of market segments with rather different needs (or ways of satisfying them).
- *Supply* – with the help of products with certain attributes (price, quality, brand, design, performance etc.) it is possible to satisfy these needs. Attributes are an important part of the differentiation between products for different consumer groups (market segments), and by this also competitors try to differentiate between themselves.
- By virtue of conformity between expectations of competitive products suitability with the consumers´ needs (expected value) demand for particular products is shaped. The influence of the expected value includes the minimum treshold, which the consumers of the given segment are not willing to get behind, and the maximum treshold where the perceived value provided by the product loses its differentiating ability (see e.g. Christensen – Raynor 2003). The question is how the minimum and maximum treshold is shaped in accordance with time? – In this sense it is possible to suppose that a minimum treshold in the particular segment will rise together with the working competition and the increase of the overall perceived values of the products.
- Consumers have *imperfect information* on how well the particular product can satisfy their needs – at most in a case when they have no personal experience with the product. This will influence their decisions.
- *Expected value* may be influenced both by word of mouth, real value deferred from attributes and the advertising actions. The more the product is spread, the more information is available about this, and the more its expected value gets closer to the real value.

We have divided end consumers into several groups composing an aging chain with iteration – A *Non Addressed Potential Market*, i.e. consumers with a latent form of need; *Inexperienced Non Consumers*, who look for the satisfaction of their need in a specific product; *First Time Consumers*, i.e. consumers who are currently consuming the product for the first time, *Experienced Non Consumers*, who have already consumed the product and have a better view of its real value; and *Experienced Consumers* who are currently consuming the products. Flows among these categories of end consumers are seen in figure 1.

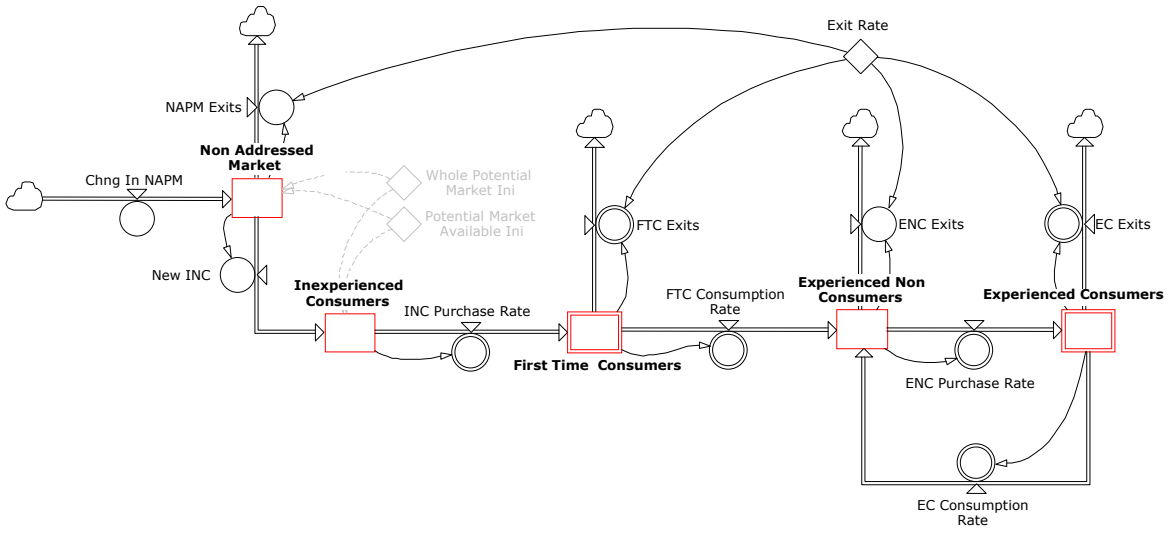

Figure 1 – Consumers' categories aging chain with an iteration structure (model excerpt)

There are demographic and geographic influences on the market of the end consumers demonstrated in the form of outflows of all the categories (Exits). These can be relativelly easily measured. In the form of the inflow they influence only Non Addressed Potential Market, which results in the fact that these are then new Inexperienced Consumers. These flows inclusion is for getting as close as possible to the real markets and data available for model setup.

Exposing the latent need in the Non Addressed Market is influenced both by specifically aimed advertising actions and the influence of word of mouth. The word of mouth influences can be of various strengths according to positive (keen consumers), neutral (satisfied consumers) or negative experience (dissatisfied consumers).

The consumers (Inexperienced Non Consumers, Experienced Non Consumers) select between various competitive products by virtue of their expected value, availability of the product and price.

The expected product value consists of a real product value based on physical attributes (needs to be operationalized for every specific product during the model implementation), an advertised value and a company/brand image. Also an influence of general satisfaction and word-of-mouth is taken into account. It differs for experienced and inexperienced consumers mainly in weights assigned to these elements.

The conceptual model is not finished yet – but we expect that it will be prepared till December 2006. We want to focus on understanding of consumers' loyalty and satisfaction impacts. Also the issue of measuring these factors is very interesting – e.g. we come out from (Reichheld 2003).

Obtaining data for model setup

As we talk about the data used for simulation we can distinguish two basic cases, which create the initial level:

1. Data within the economic subject *is available*. This data may be stored in the employees´ heads, on paper or on another kind of media in analog form; in documents in digital form or records structured by database. The information value of particular data objects declines from the initial to the last, but the possibility of sharing by people, mass processing and processing by an artificial intelligence tools increases. Going backwards it is possible to build ways for the access of data, potentially for all the employees of the company with the help of the methods of knowledge management.
2. Data within the economic subject *is not available*. Nevertheless the only thing that this situation predicts is that the facts, which are in reality proceeded, were not recorded. In this case specialized procedures need to be used. However, this of course brings the need for spending additional resources (financial, human, even time). All these procedures can be included under the common term of 'market research'.

In cases where data is necessary to simulate our constructed models, some specific demands are laid on them. This mainly includes the necessity for collecting the data about dynamic behaviour. This means data, which is consistent for several periods of time. In this case it is necessary to note that the stress on consistency plays a significant role. All changes in the data collection methodology within the time periods influence the comparability of this data in time and this change is necessary to be included into the model as another variable.

As long as we come back to the first group of data, which is available within the economic subjects, this data is usually stored in database systems. The high level structure and accessibility of this data makes its utilisation for model setup relatively easy.

The second group mentioned is represented by the data collected by the market research. Of course it is possible to collect this data directly through realisation of the concrete market research, where the data would be relevant at a maximum to the model demands. Unfortunately market research realisation represents a high demand on people, material and even financial funding to fulfil all the methodological issues. In case of realisation by the market research agency, we do not need our own human and material resources, but we will have to multiply funding by several times.

Next steps

In the next stages we want to finish our models (FMCG, durables, services), calibrate them with some data from real markets and test various scenarios and strategies – some important issues, as we see them, are around consumers' loyalty, satisfaction and their impacts. As a second output we plan to

prepare a technique of using these models within marketing decision support systems and obtaining necessary data from internal information system and marketing research.

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