

Edward SZCZERBICKI*, Maciej WASZCZYK**

MODELS AND SOFT MODELLING IN ECONOMICS AND VIRTUAL MARKETS

Descriptive or soft modelling is characterized as an initial stage of any modeling approaches, including the one represented by econometrics. The requirement to begin modeling process from non-quantitative perspective represents the vital precondition to satisfy the "isomorphism" function of modeling in relation to real live systems being modeled. The paper presents the model of online retailing as an example of model of virtual market. According to the model, the sale's structure and market share, are contingent on three groups of factors: a group of market factors, a group of technological factors and a group of factors being a consequences of human nature. In the center of the model is functionality of the internet transaction sites as a battlefield between mentioned three groups of factors.

1. DESCRIPTIVE MODELLING IN ECONOMICS

In writings on the topic of modelling, the following types of models are frequently distinguished: analogical models, thought models, mechanical models, descriptive models, and theoretical models. Other categories of models mentioned in literature include: material and ideal, structural and functional, analogical, homomorphic and isomorphic, theoretical and technical, real and adequate, theoretical and intertheoretical, material and abstract, or material and thought models. On the other hand, the trend is observed in economic sciences to interpret word „model” narrowly, econometrically. In this interpretation as a model of economic phenomenon we consider a model formalized with the aid of linear algebra, more rarely with the help of nonlinear algebra language.

The method of model explanation can be characterized as: 1. ambiguous, since it does not exclude other types of explanation founded on analogy; 2. hypothetical, regarding the hypotheses it contains; 3. non-direct, because the explanation laws are, after being modified, transported onto the models' isomorphic domain, from which the explanation derives. That is why every model explanation has to contain descriptive (schematic) models, while more advanced explanation must also incorporate theoretical models which formally put in order the empirical regularity by generalization and introduction of axiomatics.

* The University of Newcastle, Newcastle, Australia; Gdansk University of Technology, Gdansk, Poland

** Gdansk University of Technology, Gdansk, Poland; Wirtualna Polska SA, Gdansk, Poland

Qualitative (non-quantitative) modelling, or soft modelling, is an initial stage of any modelling approaches, including the one represented by econometrics. The requirement to begin modelling process from non-quantitative perspective represents the vital precondition to satisfy the "isomorphism" function of modelling in relation to real live systems being modeled. Qualitative as well as quantitative description models create the foundation for explanatory models development. These, in turn, can be used for prediction purposes satisfying the third of the three main scientific functions: description, explanation and prediction. Descriptive model combined with formalized model can present the base for building explanation model, which used as the base of forecasting activity closes the cycle of scientific research at the testing stage [Figure 1].

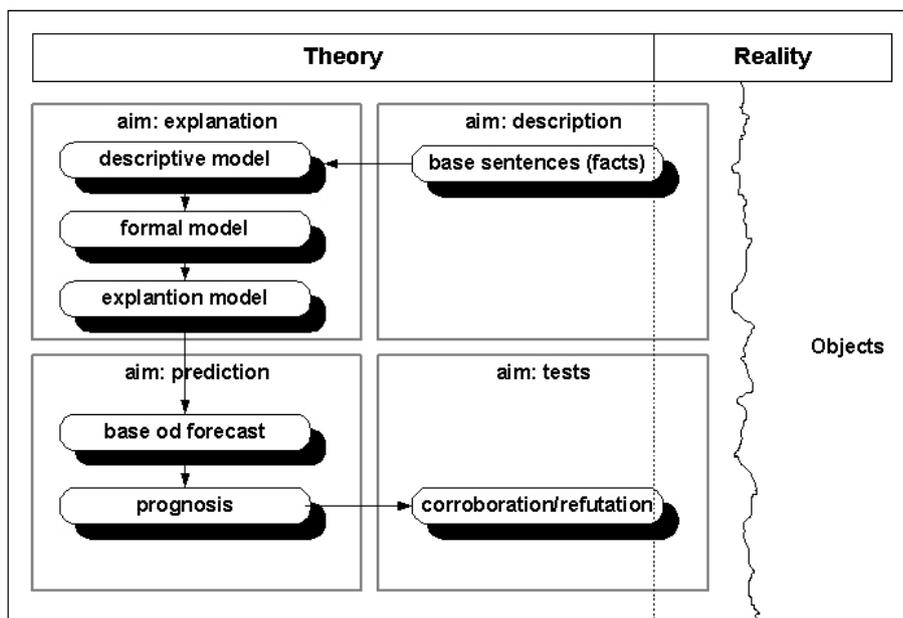


Fig. 1. Descriptive modelling and scientific purpose.

Some researchers argue that human actions are hardly foreseeable, some, in an opposite manner, accept simplification in which people perform actions in the rational manner. Institutionalists focus on economics embedded in social realities and try to include all possible conditions and parameters – this is a wide approach. Monetarists narrow their areas of investigation to selected factors only and economic relations. In this paper it is postulated that the higher level of abstraction used in specification of the objective of economic analysis, the farther such analysis is apart from economic realities. But on the other hand we have to remember all the time that deep and thorough real life description does not validate a theory automatically.

The object of economic research is usually a complex system and as such it is appropriate to describe it through a modelling process. The authors believe, on the grounds of general methodology of science, that the stages of system decomposition and qualitative description of the modeled system (including economic systems) are indispensable in the modelling process. The description of a modelled system should be maximally detailed and comprehensive, yet not deprived of elements of abstraction and schematization. Such an

approach can help to model and explain a system even when information regarding system's functioning is partial, uncertain or incomplete.

The proposed three-step model of system analysis in management sciences indicates that a system should be analyzed by:

1. Division (decomposition) into factors ,
2. Description of these factor,
3. Integration into the overall solution

In particular, such procedure is applicable in the analysis of complex systems. It is indicated, that the three-stage approach is useful in defining the flow of information and exchange of information inside the system and between the system and its surroundings. It can also be useful in dealing with delays, incompleteness, imprecision and loss of information.

2. ONLINE RETAILING AND NON-CLASSIC-HOME-SHOPPING MODEL

The model of a virtual market will be presented through the example of online retailing. Internet retailing should be classified as a non-classic-home-shopping model of sale just as in the case of TV or telephone shopping [Figure 2]. However, the internet retail trade has some distinguishing features making such retailing fundamentally separate from the other types of sales in the non-classic-home-shopping model, as will be shown in third part of this paper.

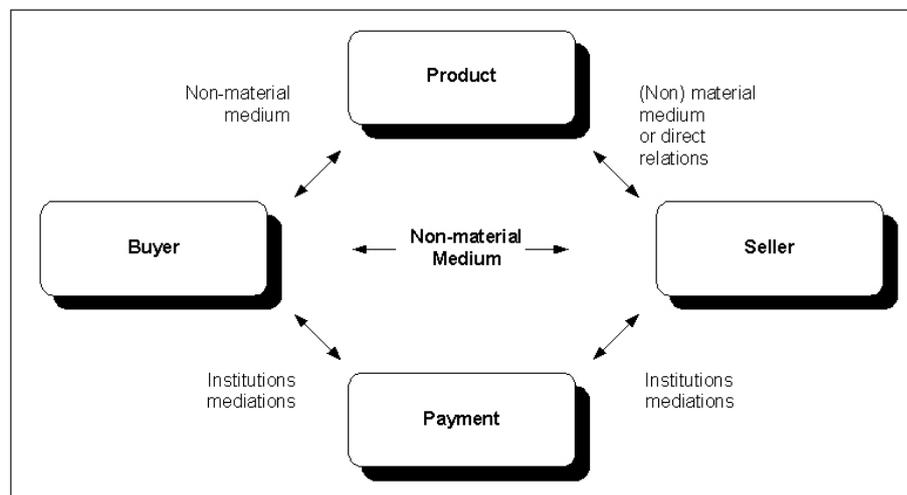


Fig. 2. Non-classic-home-shopping model of retail transactions.

In the non-classic-home-shopping model no direct contact between the buyer, seller and the product is made, besides the exception of the seller – product relation, when the direct contact occurs and the intermediary medium is non-material in its character. The payments can be done only with the help of financial or postal institution.

Such sale is particularly interesting due to the fact, that the internet trade is one of its types. In this model one can make use of different non-material media carrying the information on the product and on the methods of possible transactions. One can make use

of these, but it is a very rare manner in the internet. There are essentially three exemplifications of such model.

- Teleshopping through the TV – speeded mainly in the developed countries, the method of performing transactions through TV and phone. The product is usually sent by post or a courier, while the payment is fixed by the institutions mediation.
- Teleshopping by phone – popular mainly in USA. The difference between this and the previous one lies in the fact, that the offer is made by phone by the person calling the potential client.
- WAP – the protocol allowing to familiarize with the offer as well as to make an order by mobile phone. WAP never has acquired a significant place in the retail trade market.
- Internet – medium of many advantages over non-classic-home-shopping and other models.

3. DESCRIPTIVE MODEL OF ONLINE RETAILING

The model of a online retailing assumes that its significance (IOR) expressed by the structure of retail and by dynamics of participation of internet transactions in retail trade – is conditioned by functionality (FUN) influenced by two groups of factors: a group of technological factors (TFG) and a group of human factors (HFG). These two groups are opposite in their character and rival each other in the presence of the third group: the group of market factors (MFG) [Figure 3]

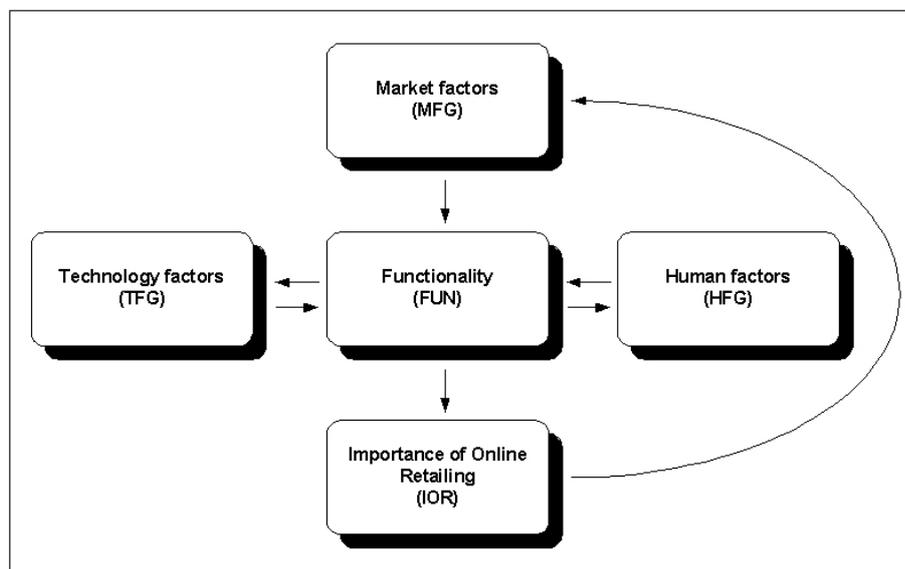


Fig. 3. Description model of online retailing.

The factors contained in TFG and HFG groups are influenced by the feedback from economic practice functionality of the internet transaction services (FUN). The MFG factors influence the functionality (FUN), yet the feedback relation takes place indirectly through

the „significance of internet retail trade” (IOR) expressed on market share and sale’s structure.

The group of market factors (MFG) comprises five factors, the technological factors group (TF) includes four components, and the group of human factors (HF) – four factors. The functionality (FUN) of retail transaction services, in turn, is made up of thirteen functionality types.

The group of market factors (MFG) embraces many components, of which the following seem to be of the utmost importance:

- market conditions,
- law regulations,
- penetration of computers,
- internet accessibility,
- number of internet users.

The significance of these factors consists in the creation of proper surroundings for the occurrence of market transactions. They may basically restrain or evolve such transactions. The example of such situation may be provided by the law regulations of some countries forbidding the usage of internet – practically precluding the development of internet trade. At the other hand, the high per capita level of some other countries national income would stimulate the most comfortable ways of consumption purchases – it shall only be settled if the internet does provide such a comfort.

The group of technological factors (TFG) contains four components which, in the authors opinion, stand for the most important practical consequences of common application of new technologies:

- the propagation of information,
- mass customization,
- interactivity,
- personalization.

Each of these factors influences in a positive manner the growth of retail transactions, although their impact is essentially correlated with the internet services functionality. If the internet services were available only in the Spanish language version, or possible to be accessed only on the very expensive computers, it would restrain the spreading of the product information in the scale of the whole globe. On the other hand, the euphoria accompanying the first ten years of internet intensive expansion has now passed, and this group’s three remaining factors, despite the technological abilities, are implemented only partially. What holds the expansion, are the components of the human factor group:

- abstraction,
- transience and no durability,
- anonymity and enigmatic character,
- human habits.

These factors spring from the functionality of services, which may evoke the lack of trust concerning the question if the ordered commodity would be delivered. People customs and human nature can radically hold in the development of internet retail transactions and radically impact the functionality of trade services in the reflexive relation, forcing them to

become more friendly, secure, trustworthy, providing the clients with more and complete information.

The authors of this paper distinguish – as a result of internet research conducted in years 2000-2002 - the following general types of functionality (FUN):

- general,
- navigation,
- search,
- registration,
- the product presentation,
- promotion,
- advertising,
- transactions,
- payments,
- extensions,
- personalization,
- advisory,
- administration.

Such enumeration is performed to bring closer the areas which seem to be most important both in the context of the technological abilities of TFG and the human limitations HFG. From these fields originates the significance of retail transactions, expressed by:

- market share,
- sale's structure.

These last two stand for the unknown of the econometric system of equations which should be an effect of further research – all this yet exceeds the framework of the present text. The forecast of these factors is the aim of reflection on the electronic retail transactions market, since it is essential for this market's future investments in the context of economics.

The range on market alongside with the sale's structure influence reflexively the MFG due to the fact, that - what seems to be quite obvious – the more significant role of internet transactions on the retail market is, the more important for the governments would be the need to introduce the legislative initiatives regulating, among others, questions of home-shopping sales, preservation of consumers rights, protection of brand names, electronic signatures, or registration of C2C economic events, what remains as an unregulated matter in many countries legislation.

REFERENCES

- [1] Ajdukiewicz K.: *Argument and Explanation*. In: *Language and cognition. Collected Works 1945 - 1963*. Vol. 2. Warszawa: PWN 1985, pp. 401-408 (in Polish).
- [2] *Aristotle in 23 Volumes*. Vol 18. G.C. Armstrong (Ed). London: Harvard University Press, 1935.
- [3] Afuah A., Ch. L. Tucci: *Business Internet Models and Strategies*. Chicago: McGraw-Hill 2000.
- [4] Birch A., P. Gerbert, D. Schneider: *The Age of E-Tail. Conquering the New World of Electronic Shopping*. Oxford: Capstone Publishing Limited 2000.
- [5] Blanning R.: *E-Business and Beyond*. [In:] Szelc A. (Ed.): *E-Business and Web Based Technologies. Conference Proceedings*. Rzeszów: University of Information Technology and Management 2001, pp. 7-19.

- [6] Blaug M.: *Economic Theory in Retrospect*. London: Heineman Educational Books 1973
- [7] Blaug M.: *The Methodology of Economics. Or How Economists Explain*. Cambridge: Press Syndicate of the University of Cambridge 1982.
- [8] Bocheński J. M.: *Modern Methods of Thinking*. Poznań: W Drodze. 1992 (in Polish).
- [9] Brown K. T.: *The Interactive Marketplace*. New York: McGraw-Hill 2001.
- [10] Bunge M.: *Causality. The Place of the Causal Principle in Modern Science*. Cambridge, Massachusetts: Harvard University Press 1959.
- [11] Carpenter P.: *eBrands. Building an Internet Business at Breakneck Speed*. Boston: Harvard Business School Press 2000.
- [12] Cox R., P. Brittain: *Retail Management*. London: Pitman Publishing 2000.
- [13] Daszkowska M.: *Economics and Organization of Services*. Warszawa: PWN 1982 (in Polish).
- [14] Daszkowska M.: *Services. Manufacture. Market. Marketing*. Warszawa: PWN 1998 (in Polish).
- [15] Davidson W.R., D.J. Sweeney, R.W. Stampfl: *Retailing Management*. New York: John Wiley & Sons, Inc. 1988.
- [16] Deise M. V., C. Nowikow, P. King, A. Wright: *Executives Guide to E-Business. From Tactics to Strategy*. New York: John Wiley & Sons, Inc. 2000.
- [17] Dietl J.: *Trade and Modern Market. Institutions-Organizations-Technology-Strategy*. Warszawa: PWE 1991 (in Polish).
- [18] Elliot S.: *Electronic Commerce. B2C Strategies and Models*. New York: John Wiley & Sons Ltd 2002.
- [19] Fellenstein C., R. Wood: *Exploring e-Commerce. Global e-Biznes and e-Societies*. New Jersey: Prentice Hall PTR 2000.
- [20] Feyerabend P. K.: *How to Be a Good Empiricist – A Plea for Tolerance in Matters Epistemological*. In: B. Baumrin (ed.): *Philosophy of Science. The Delaware Seminar*. Vol. 2. New York: Interscience 1963, pp. 3-40.
- [21] Fingar P., H. Kumar, T. Sharma: *Enterprise e-Commerce*. Tampa: Meghan-Kiffer Press 2000.
- [22] Galbarith J. K.: *Economic Development in Perspective. A Critical History*. Boston: Houghton Mifflin Co. 1987.
- [23] Hajduk Z.: *Some Aspects of Explanation*. *Annals of Philosophy*. Vol. 17. 1969, pp. 85-123 (in Polish).
- [24] Hajduk Z.: *Concept and Function of a Model*. *Annals of Philosophy*. Vol. 20. 1972, pp. 78-124 (in Polish).
- [25] Hajduk Z.: *Conditions of Scientific Progress in Theories of Research Development. Part II*. *Annals of Philosophy*. Vol. 39-40. 1991-1992, pp. 22-55.
- [26] Hartman A., J. Sifonis, J. Kador.: *Net Ready – Strategies for Success in the E-economy*. New York: McGraw-Hill 2000.
- [27] Hempel C. G., Oppenheim P.: *Studies in the Logic of Explanation*. *Philosophy of Science*. Vol. 15. 1948, pp. 135-175.
- [28] Hempel C. G.: *Philosophy of Natural Science*. New Jersey: Prentice-Hall 1966.
- [29] Hicks J. R.: *Linear Theory*. *The Economic Journal*. Vol. 70. 1960, pp. 672-707.
- [30] Kalakota R., M. Robinson: *E-Business. Roadmap for Success*. Reading: Addison Wesley Longman Inc. 1999.
- [31] Kauffman, Robert J., and Walden, Eric A.: *Economics and Electronic Commerce: Survey And Research Directions*. *International Journal of Electronic Commerce*. Vol 5, No. 4, Summer 2001, pp. 5-117.
- [32] Keynes J. M.: *The General Theory of Employment, Interest and Money*. London: Macmillan 1946.
- [33] Kourdi J.: *New Economy Edge. Strategies and Techniques for Boosting Online Profitability*. Chichester: John Wiley & Sons Ltd 2001.
- [34] Köhler T.R., R.B. Best: *Electronic Commerce*. Munchen: Pearson Education Detschland 2000 (in German).
- [35] Kowalik P. J.: *Some Problems of Modelling Theory*. *Gdańskie Zeszyty Humanistyczne*. Vol. 8. 1965, pp. 25-37 (in Polish).
- [36] Lubański M.: *Information-System*. In: M. Heller, M. Lubański, S. W. Szlaga (ed): *Philosophical Problems of Modern Science*. Warsaw: ATK 1982, pp. 14-164 (in Polish)
- [37] Lubański M.: *Explanation and Testing*. *Annals of Philosophy*. Vol. 20. 1972, pp. 47 – 57 (in Polish).
- [38] Mazierski S.: *Justification and Diversity in Natural Sciences Prediction*. *Studia Philosophiae Christianae*. Vol. 9. 1973, pp. 87-102 (in Polish).
- [39] Mayer T.: *Truth versus Precision in Economics*. Aldershot: Edward Elgar Publishing Limited 1993.
- [40] Nagel E.: *The Structure of Science: Problems in the Logic of Scientific Explanation*. London: Routledge and Kegan Paul 1961.
- [41] Nikitin E.: *Explanation as Scientific Function*. Warsaw: PWN 1975 (in Polish)
- [42] *Philosophy and Science. Encyclopedic Outline*. Z. Cackowski, J. Kmita, K. Szaniawski, P. J. Smoczyński (Eds.). Warsaw: PWN 1987 (in Polish).

- [43] Popper K. R.: *The Logic of Scientific Discovery*. London: Hutchinson Publishing Group Ltd 1974.
- [44] Rosen M.: Some Notes from the Field: On Ethnography and Organizational Science. *Dragon*. Vol. 6. 1986, pp. 57-77.
- [45] Shaw M., R. Blanning, T. Strader, A. Whinston (Eds.): *Handbook on Electronic Commerce*. Berlin: Springer 2000.
- [46] Seybold P. B., R. T. Marshak: *Customers.com. How to Create a Profitable Business Strategy for the Internet and Beyond*. New York: Times Business Random House 1998.
- [47] Siegel D.: *Futurize Your Enterprise. Business Strategy in the Age of the E-Customer*. New York: John Wiley and Sons, Inc. 1999.
- [48] Szczerbicki, E.: Modelling and identification of manufacturing systems: decomposition stage. *International Journal of Systems Science*. Vol. 24. 1993. pp. 1509-1518.
- [49] Szczerbicki, E.: Rule-based functional decomposition and representation of manufacturing agents. *Systems Analysis, Modelling, Simulation*. Vol. 11. 1993. pp. 1-15.
- [50] Szczerbicki E., P. Jinadasa: Modelling for Performance Evaluation in Complex Systems. *Systems Analysis, Modelling, Simulation*. Vol. 38. pp. 637-649. 2000
- [51] Szczerbicki E.: Management of Complexity and Information Flow in Agile Manufacturing. In: A. Gunasekaran (Ed.): *Agile manufacturing: The 21st Century Competitive Strategy*. Amsterdam: Elsevier 2001, pp. 269-290.
- [52] Szczerbicki, E.; M. Waszczyk: Modelling of Complex Economic Systems: Towards Conceptual Platform. *Systems Analysis, Modelling, Simulation*. (in press).
- [53] Szczerbicki, E.; M. Waszczyk: Introduction to a Descriptive Model of Online Retailing. *Systems Analysis, Modelling, Simulation*. (in press).
- [54] Subramani M.; E.A. Walden: Economics Returns to Firms from Business-to-Business Electronic Commerce Initiatives: an Empirical Examination. [In:] W.Orlikowski, S Ang, P. Weill, H. Krcmar, J. I. DeGross (Eds.): *Proceedings of the Twentieth International Conference on Information Systems*. Brisbane, Australia, December 10-13, 2000, pp. 229-241.
- [55] Waszczyk M.: E-Commerce. Main Distribution Channel in New Economy. [In:] Szalc A. (Ed.): *E-Business and Web Based Technologies. Conference Proceedings*. Rzeszow: University of Information Technology and Management 2001, pp. 119-127.
- [56] Waszczyk M.: Cultural and Social Aspects of Internet Transactions. [In:] J. Kubka (Ed.): *Etyka w edukacji menedżerskiej i praktyce ekonomiczno-społecznej*. Gdańsk: ZPPG 2001, pp. 71-91 (in Polish).
- [57] Waszczyk M.: Responsibility Electronic Business. *Prakseologia*. 142/2002, pp. 225-247 (in Polish).
- [58] Waszczyk M.: To Spy on Internet Business. *Magazyn internetowy WWW*. 2/02 [58], pp. 48-50 (in Polish).
- [59] Waszczyk M.: Trust and on-line retailing. [In:] J. Kubka (Ed.) *Economics and Values*, Gdańsk 2002, pp. 131-138.
- [60] Waszczyk M.: Explanation and Prediction in Bioelectronic. *Annals of Philosophy*. Vol. 42. 1996, pp. 145-176 (in Polish).
- [61] Zeigler B. P.: *Theory of Modelling and Simulation*. New York: John Wiley and Sons 1976.