DOI: https://doi.org/10.24297/ijmit.v17i.9257

The interaction between IT and planning: decision support or knowledge generation?

Caserio C[1]

[1]Università degli Studi eCampus, Novedrate (CO), Italy

Abstract

The present study aims to discuss, under a theoretical perspective, the role and the added value of the interaction between Information Technology (IT) and decision-making, paying particular attention to the planning context. The main idea of this paper is that the interaction of decision makers with IT, especially when the decisions concern scenario planning and alternative hypotheses, plays two important roles: a) it supports decisions, given the availability of semi-structured information and data provided by IT tools; b) it generates knowledge due both to the iterative approach followed by the decision maker for designing the planning model and to the reasonings and group discussions about the objectives to be defined. The conclusions speculate that the interaction between IT and decision makers is not limited to provide decisional support, but it also generates knowledge and promotes a learning process, especially in a complex decision domain. Therefore, further research is encouraged on this issue, for examining to what extent, and under which conditions, the interaction with IT allows to generate or increase knowledge about a problem, beyond a mere decision support.

Keywords: Information Technology, Planning, Decision Support Systems, Knowledge, Scenario

Introduction

The aim of this study is to discuss, through a theorical approach, the added value created by the interaction between decision-making process and Information Technology (IT). The adoption of IT has led to new needs, challenges, goals and opportunities in companies (Fu, 2014; Bakos and Treacy, 1986), also considering that information becomes knowledge when communicated and internalized into the mental patterns, therefore IT plays an important role in favouring the communication of information. Human capabilities play an equally crucial role in the internalization of information into the mental patterns. Thus, under a knowledge perspective, IT allows managers to convert their tacit knowledge into an explicit form and to spread it around the company (Alipour et al., 2011; Nonaka, 1991).

According to the literature, the main assumptions to be considered about the relation between IT and decision-making process are the following:

- the large quantity of data and the high complexity of the problems make IT even more necessary (Kaisler et al., 2013);
- the solution of the problem involves decision makers' subjective evaluations and conceptual models (Keen and Scott Morton, 1978);
- conceptual models, based on the relevant variables of the business, have to be formalized in reality models in order to be managed (Marakas, 2003);
- the conversion of conceptual model into formal model is supported by the IT, which reduces biases in managers' conception of the problems, increasing the understanding of the reality (Mintzberg, 1973);
- the "effort" to formalize a conceptual model leads to a deep understanding of the causal links beneath the model itself (Coda, 2010).

The IT support in the decision-making process is confirmed by the literature, which recognizes that "using Information Technology (computers, communication and databases) is an active part of a decision process" (Scott Morton, 2007), therefore an effective interaction between decision makers and IT is able to improve the ability of managers to deal with complex mental tasks and with unstructured decisions. The potentialities of this interaction do particularly emerge in the strategic planning context (Molloy and Schwenk, 1995).

IT and decision-making interaction in the planning context

Knowledge is even more considered as a source of competitive advantage and it may affect the success and the failure of a company (Drucker, 1995; Sanin and Szczerbicki, 2004). One of the most difficult tasks related to the knowledge is its representation and transformation from a tacit to an explicit form; at this regard, technology plays the crucial roles of allowing decision makers to explicit their tacit knowledge, to store the explicit knowledge obtained and to improve the decision-making process (Sanin et al., 2007).

According to Noble's theory, decision makers act on the basis of their previous experience rather than on their knowledge, applying the same solution for similar problems (Noble, 1993); on this preliminary consideration Sanin et al. (2007) proposed a Knowledge Supply Chain System (KSCS) which manipulates sets of experience (variables, functions, constraints and rules) to help managers in taking decisions. On these bases, a decision maker can be involved both in the use of a model and in its design (Caserio, 2012; Caserio and Marchi, 2010). This concept is extendible to the planning model field, in which decision makers, through the support of IT, can both design a planning model, formalizing rules and key variables, and use the model itself. At this regard, literature clearly sustains that in designing a planning model the role of IT is extremely crucial (Şen et al., 2019; Power and Heavin, 2017; Pinson et al., 1997).

IT allows decision makers to transform their conceptual model into a formal model, both through the definition of variables, functions, constraints and rules and through the setting of variables and relationships. This process, along the time, may allow a continuous testing, revising and updating of variables, relationships and settings.

Such type of model combines the capacity of an expert system to automatically solve well-defined domains problems with the capacity to manage the unstructured cognitive process of decision makers, allowing these latter to generate knowledge from the reasonings underlying the definition of variables and relationships and from the continuous checks performed to validate the model (Caserio and Marchi, 2010; Kloot, 1997).

IT and financial planning interaction: decision support and knowledge generation

The financial planning process includes activities in which managers elaborate decisions about the future taking into account external and internal variables, combined with past trends (Shim and Siegel, 1991). In order to obtain reliable predictions, in fact, past financial results can assume the role of starting point to carry out hypotheses with the aim to estimate the future financial dynamics.

This estimation, which belongs to the semi-structured decisions (Gorry and Scott Morton, 1971; Keen and Scott Morton, 1978) and pertains to the strategic planning and control context, involves two main aspects, both strictly connected with IT: a) a forecasting model; b) a simulation model.

First one mainly consists in a mathematical model which predicts future dynamics basing on more or less sophisticated approaches. The second one allows to simulate different scenarios and hypotheses, starting from the past financial situation (or from the forecast values). The "added value" of simulation is that it is more judgemental, as it allows decision makers to include their personal perceptions of the reality, their views and interpretation of current and future dynamics, also on the basis of the future strategic aims and policies (Chermack, 2004; Georgantzas and Acar, 1995). This allows a scenario-based planning which combines an "objective" part (the mathematical forecasting) with a "subjective" part (the personal view of decision makers).

In these models the IT tools play a key role as they provide the decision-making process with the digital infrastructure on which planning models are built, as well as the possibility to customize the planning model by introducing further variables and attributing different weights to them. Furthermore, the capabilities and the opportunities offered by modern technology is one of the success factors for decision makers to obtain a more timely and effective support (Ratcliffe, 2003).

Therefore, the possibility to customize the planning model, to simulate different hypotheses and scenarios and to make "an exercise in both reflection and imagination" (Ratcliffe, 2003) with an interactive and collective approach, make the planning process able to not only supporting decisions but also to generating knowledge. This result could be achieved on two different levels:

- at the design level, when the decision maker participates in the design of the conceptual planning model, in the definition of variables, constants, rules, logic for the derivation of values, information to be taken into account. Managing directly the design of conceptual model allows decision-makers to convert their views into formal terms, in doing so converting tacit into explicit knowledge (Nonaka, 1991; Nonaka and Takeuchi, 1995);
- at the level of use, through the interaction with the planning model, through a continuous testing and reviewing of alternative hypotheses and scenarios formalized through the planning model. From the hypotheses formulated, in fact, through financial indicators such as the imbalance between sources and uses, the decision-maker could acquire new learning elements about the sustainability of the economic and financial hypotheses.

The capacity to generate knowledge is also confirmed by the literature which sustains that the interaction between IT and decision-making process, as well as the iterative feedback and scenario-based control, allows to create knowledge on the relevant financial and economic variables of the business (Burt and Chermack, 2008; Veloso et al., 1995; De Geus, 1988; Mock, 1973). Furthermore, the support of IT is also due to features such as easy interactivity, immediate interpretation, information process acceleration, rapid learning (visualization of trends and indicators) (Rossignoli and Ferrari, 2008), which furtherly favour a knowledge generating process.

Conclusions

The topic of this research is the interaction between IT and decision-makers during a financial planning process. This interaction happens in at least two moments: a) when the planning model has to be designed; b) when the planning model is used.

With regard to the first moment, the interaction allows the decision-makers to make explicit, and to formalize through IT support, their knowledge on the external and internal environment, their entrepreneurial vision and their strategic intentions. Regarding the second moment, the interaction allows for the formulation of hypotheses and scenarios, the testing and revising of hypotheses, the evaluation of the sustainability of the hypotheses and scenarios.

The two phases described above should not be intended as neatly separated. During the use of the model, further variables may in fact be added (such as inflation rate, market trends, new unpredictable information, etc.) and even new elements may emerge (such as, the logic for the derivation of the values, the causal link between the variables of the model, new constraints, different and more suitable forecasting approach, etc.) making necessary an update of the planning model design itself.

Consequently, this issue involves a human and a technological aspect: with regard to the former, decision makers may introduce into the "IT-planning" system their own implicit knowledge of the sector, of the market, of the competitors, of the internal and external forces of the company; with reference to the latter, IT supports the collection of data and information, provides processing capabilities and supports managers with simulation of hypotheses and scenarios.

This interaction, therefore, may both provide semi-structured information for supporting the decision makers and allow for the generation of new knowledge on the several business areas involved in the planning process. This knowledge may arise from the discussion on hypotheses and scenarios, from sharing opinions on the environment, on the policies, on the strategies, from making comparisons of different scenarios, partly based on data and information, partly based on the subjective perceptions of the decision makers involved. For this reason, the advantages of a such interactive process may become more evident when several decision makers, which are also "knowledge owners" on different business units, on different key processes, on critical success factors, etc., do participate in simulating alternative scenarios, in examining the possible results, in testing and revising the hypotheses.

The interaction may allow to obtain a broader view of the problem, to identify the causes of a variance, or to prevent too high negative variances, to identify the strengths and weaknesses of the company and of the business units, the opportunities and the threats, and, in general, the future objectives that most align with the underlying strategic aims taking into account the firm capabilities. For the interaction to be effective, the set of data and information should be timely provided by the IT systems on the past performance of the company, on the current trends and on future forecasts.

References

1. Alipour, F., Idris, K., Karimi, R. (2011). Knowledge creation and transfer: Role of learning organization. International Journal of Business Administration, 2(3), 61. DOI: https://doi.org/10.5430/ijba.v2n3p61

2. Bakos, J. Y., Treacy, M. E. (1986). Information technology and corporate strategy: a research perspective. MIS quarterly, 107-119. DOI: https://doi.org/10.2307/249029

3. Burt, G., Chermack, T. J. (2008). Learning with scenarios: Summary and critical issues. Advances in Developing Human Resources, 10(2), 285-295. DOI: https://doi.org/10.1177/1523422307313334

4. Caserio C. (2012), Knowledge Generating Decision Support Systems: managing the trade-off between generating knowledge and supporting decisions, in M. De Marco, D. Te'eni, V. Albano, S. Za (Editors), Information Systems: Crossroads for Organization, Management, Accounting and Engineering. Springer. DOI: https://doi.org/10.1007/978-3-7908-2789-7_34

5. Caserio C., Marchi L. (2010), Generating knowledge by combining prediction models with Information Technology, in D'Atri A., De Marco M., Braccini A.M., Cabiddu F. (Editors) Management of the Interconnected World, 1st edition, Springer.

6. Chermack, T. J. (2004). Improving decision-making with scenario planning. Futures, 36(3), 295-309. DOI: https://doi.org/10.1016/S0016-3287(03)00156-3

7. Coda, V. (2010). Entrepreneurial values and strategic management: essays in management theory. Palgrave Macmillan London. DOI: https://doi.org/10.1057/9780230299054

8. De Geus, A. P. (1988). Planning as learning (pp. 70-74). March/April: Harvard Business Review.

9. Drucker P. (1995) The Post-Capitalist Executive: Managing in a Time of Great Change, Penguin, New York.

10. Fu, M. (2014). Design of Accounting Information System of Modern Enterprises under Informatization Environment. In 2nd International Conference on Education Technology and Information System (ICETIS) (pp. 254-257).

11. Georgantzas, N. C., Acar, W. (1995). Scenario-driven planning: learning to manage strategic uncertainty. Praeger.

12. Gorry G.A., Scott Morton M.S., (1971) A Framework for Management Information Systems, in Sloan Management Review, vol. 13

13. Kaisler, S., Armour, F., Espinosa, J. A., Money, W. (2013, January). Big data: Issues and challenges moving forward. In 2013 46th Hawaii international conference on system sciences (pp. 995-1004). IEEE. DOI: https://doi.org/10.1109/HICSS.2013.645

14. Keen P.G.W., Scott Morton M.S., (1978) Decision Support System: an organizational perspective. Reading, Addison-Wesley

15. Kloot, L. (1997). Organizational learning and management control systems: responding to environmental change. Management Accounting Research, 8(1), 47-73. DOI: https://doi.org/10.1006/mare.1996.0033

16. Marakas, G. M. (2003). Decision support systems in the 21st century (Vol. 134). Upper Saddle River: Prentice Hall.

17. Mintzberg, H. (1973). The nature of managerial work. New York: Harper & Row.

18. Mock, T. J. (1973). The value of budget information. The Accounting Review, 48(3), 520-534.

19. Molloy, S., Schwenk, C. R. (1995). The effects of information technology on strategic decision making. Journal of Management Studies, 32(3), 283-311. DOI: https://doi.org/10.1111/j.1467-6486.1995.tb00777.x

20. Noble, D. (1993). A model to support development of situation assessment aids. In G. A. Klein, J. Orasanu, R. Calderwood, & C. E. Zsambok (Eds.), Decision making in action: Models and Methods. Norwood, NJ: Ablex Publishing Corporation.

21. Nonaka I. (1991) The Knowledge-Creating Company, Harvard Business Review, Nov/Dic, Vol. 69(6):96-104.

22. Nonaka I., Takeuchi K., (1995) The Knowledge Creating Company, Oxford University Press.

23. Power, D. J., Heavin, C. (2017). Decision support, analytics, and business intelligence. Business Expert Press.

24. Pinson, S. D., Louçã, J. A., Moraitis, P. (1997). A distributed decision support system for strategic planning. Decision Support Systems, 20(1), 35-51. DOI: https://doi.org/10.1016/S0167-9236(96)00074-7

25. Ratcliffe, J. (2003). Scenario planning: An evaluation of practice. Futures Research Quarterly, 19(4), 5-26.

26. Rossignoli C, Ferrari A., (2008) Organization Processes Monitoring: Business Intelligence Systems Role, in:D'Atri A., De Marco M., Casalino N. (Editors), Interdisciplinary Aspects of Information Systems Studies, Physica-Verlag, Heidelberg. DOI: https://doi.org/10.1007/978-3-7908-2010-2_21

27. Sanin C., Szczerbicki E. (2004) Knowledge Supply Chain System: A Conceptual Model, Knowledge Management: Selected Issues, Szuwarzynski A. (Ed), Gdask University Press / Gdask, 79-97.

28. Sanin C., Szczerbicki E., Toro C. (2007) An OWL Ontology of Set of Experience Knowledge Structure, Journal of Universal Computer Science, 13(2):209-223.

29. Scott Morton M.S., (2007) Reflections, DSSResources.COM.

30. Şen, E., Körük, E., Serper, N., Çalış Uslu, B. (2019). Big Data Analytics and Simulation for Better Strategic Management. Journal of Current Research on Engineering, Science and Technology, 5(2), 1-12. DOI: https://doi.org/10.26579/jocrest.36

31. Shim J.K., Siegel J.G., (1991) Handbook of Financial Analysis, Forecasting and Modeling, Pearson Professional Education

32. Veloso, M., Carbonell, J., Perez, A., Borrajo, D., Fink, E., Blythe, J. (1995). Integrating planning and learning: The PRODIGY architecture. Journal of Experimental & Theoretical Artificial Intelligence, 7(1), 81-120. DOI: https://doi.org/10.1080/09528139508953801

Conflicts of Interest

The author declares that he has no conflict of interests.