Benefits of Entrepreneurship Education using an Interactive Learning Environment

Abstract

Traditional approaches to entrepreneurship education have been increasingly criticized. Very often they rely on lectures and discussions in which the teacher play the role of "the sage on the stage", resulting ineffective in overcoming conceptual errors, building actionable knowledge, enhancing problem solving and system thinking skills. The use of standard and traditional frameworks, for instance, aimed to instruct entrepreneurs on how the business should be run, may generate alienation of the entrepreneur being the approach inappropriate to take into account the firm's specific context.

The use of Interactive Learning Environments, based on the System Dynamics methodology, can contribute to question decision makers' mental models and to favour changes in their beliefs and habits. This process can be supported through an active engagement, in which learners can get interactively prompt feedbacks from their decisions, resulting in new knowledge.

In the paper an ILE capturing the growth of a small family-owned firm will be described. The focus of the ILE is on understanding the dynamics generated by commercial and financial policies on sales revenues and profitability – on one side – and the net working capital and liquidity, on the other side. Benefits from the use of such a learning tools are also discussed.

The use of Interactive Learning Environments (ILEs) based on the System Dynamics Methodology to support Entrepreneurship Education

An Interactive Learning Environment (ILE) is commonly defined in literature as a computer simulation, based on a model created with the System Dynamics Methodology (Sterman 2000; Groesser 2006; Sterman 2014). The purpose of the model is to learn about an issue of interest of a given participant/user target. The user is asked to perform successfully in a simulation settings characterized by distributed decision-making over time. They are commonly used for education purposes especially in the fields of business administration, economics, and ecology and other fields.

Traditional approaches to entrepreneurship education have been increasingly criticized. Very often they rely on lectures and discussions in which the teacher play the role of "the sage on the stage" (King, 1993), resulting ineffective in overcoming conceptual errors, building actionable knowledge, enhancing problem solving and system thinking skills (King, 1993; Dori and Belcher, 2005; Lasry et al., 2008; Kim and Pak, 2002; Sterman, 2014).

Some scholars also remarked that management education mainly based on lectures and case study method is particularly prone to these failures (Pfeffer and Fong, 2002; Mintzberg, 2005).

Perren (1999) in investigating those factors underlying the growth of micro-enterprises asserted that such decision makers needed for a tailored and timely support, rather than any form of standard approach which will be wasteful. The use of standard and traditional frameworks, for instance aimed to instruct entrepreneurs on how the business should be run, may generate alienation of the entrepreneur being the approach inappropriate to take into account the firm's specific context.

Therefore, a dilemma may appear. A teacher can lecture about, for instance, how short and long-term policies may impact in the investigated systems, but the lecture risks to be very ineffective; at the same time, the use of demonstrations, role plays and similar action learning experiences may result not compatible within classroom constraints, in terms of time and space available, making the teach experience ineffective.

The use of ILEs can contribute to the transmission of learning, in which teachers play the role of "the guide on the side" (King, 1993). Based on such an approach, learning and innovation in business require experimentation, simulations and "serious play" (Sterman 2014). As largely recognised in literature, learning occurs when learners question their mental models and they are willing to change their beliefs and habits. This process can be favoured through an active engagement with a system, in which learners can get interactively prompt feedbacks from their decisions, resulting in new knowledge.

Furthermore, ILEs allow to overcome other physical difficulties: experiments in real life may require a very long time horizon to make sure time delays between decisions and related effects are counted; they may be very expensive or consequences may be irreversible.

ILEs based on System Dynamics simulation models can provide a possible solution to solve the above difficulties. Simulations can allow learners, for example, to simulate a 5-year plan in a few minutes and to re-simulate it again and again without any additional cost. In addition, in presence of situations whether experiments are costly, unethical or just impossible, perhaps simulations become the main way to active learning is such complex systems (Sterman 2014).

Studio Castellamare ILE

In this section of the article, an ILE that represents the growth of a small family-owned firm will be described. The focus of the ILE is on understanding the dynamics generated by commercial and financial policies on sales revenues and profitability – on one side – and the net working capital and liquidity, on the other side. Another concern in this ILE is to help learners to figure out relationships between the firm and the equity-owning family. Learning on how to pursue a balanced growth, in compliance with both business and family needs, is the primary focus of the ILE.

Company background

Studio Castellamare is a small family-owned company producing a limited range of high-quality hand-painted decorative ceramic tiles for external use in pool and patio areas in up-market villas. The present market is especially in coastal locations in the Mediterranean and Adriatic areas, mainly in Italy but also in some adjacent countries. The company is presently family-owned with Antonio Bonura now the main share-holder and manager, but was founded by Antonio Bonura's father Carlo in 1960, who, along with some other family members, also retains a minority shareholding. Carlo Bonura was, and still is, a talented artist who specialised in one-off commissions to produce decorative wall tiles for villas in the Palermo and surrounding areas in northern Sicily. Carlo Bonura hand-painted the tiles, which were then glazed and fired in a small kiln. 'Marketing' was virtually non-existent, as the quality of Carlo Bonura's tiles was well known to architects and builders who would approach him with requests for his products, and word-of-mouth recommendations completed the mix when satisfied villa owners passed on his name to friends.

Antonio Bonura came into the firm straight from school in 1975, he shared his father's talent and interest in the business and quickly became an equal partner with his father. In the early years the firm was really nothing more than a father-son artisan company and no further staffs were employed. Demand for their tiles has always very high and they frequently have had to decline work. Antonio Bonura however, quickly realised that if he and his father focused on painting the tiles and they employed others to undertake the finishing processes (glazing, firing and so on), and

packing and despatch – under their supervision – then the company could expand their output significantly. In 1982 the company was formally established with Antonio Bonura as the CEO, and the name of the workshop where Antonio and his father worked, *Studio Castellamare*, was adopted as the company name.

In the succeeding 20 years, the company has expanded steadily but at a modest rate. Carlo Bonura no longer works full-time, but does still take an interest in the firm and plays a role in designing and training when new tile artists join the company. Antonio Bonura still personally oversees the painting process and does occasionally paint designs that his personal favourites, but the company now employs three locally recruited workers who have been trained up to do the painting. Antonio Bonura and his father still personally develop any new designs, recognising that new design adaptations are sometimes needed. Four further employees are involved in the other production and distribution processes, and three are involved in administration.

Despite the growth, *Studio Castellamare* tiles have retained their exclusive reputation and are still highly regarded as pieces of art. In marketing terms the company continues to be able to rely on personal approaches through its network of architects and developers who specialise in the top-end luxury villa sector, though it does now supplement this with some advertisements in specialist trade journals and they have participated on a couple of trade fairs to test reactions in new geographic market areas. *Studio Castellamare* now sells its products throughout Italy and has also attracted a few customers in southern France and in Spain, and is beginning to attract interest from Greece and emerging new EU countries in south-east Europe.

Benefits from using the ILE in learning small business growth management

The case-study provided the basis for the System Dynamics models embodied in the ILE. The ILE allows the user to investigate growth options available to the firm. Any simulator, and any model, is simplified and limited in a number ways, but these should be consistent with the purpose of the phenomenon to be investigated. The ILE associated with this Studio Castellamare has been constructed to support learning about growth options for small firms, using one company as an example. It is intended to suggest the way the firm could grow given particular sets of decisions and to stimulate thinking about how decisions are linked to outcomes and pointing to decision options that are likely to be successful, to highlight how there might be unpredicted, unintended and maybe undesirable side effects of those decisions; it is not intended however, to precise quantitative forecasts of results, nor to support a search for the “right” decisions.

The simulator consequently operates at a relatively high aggregate level – for example, it reflects only the product range not individual product items, it does not distinguish markets within the local or the foreign markets, and staffing is reflected in aggregate groupings. It has been designed therefore to support analysis of growth for this type of firm and for the kinds of competitive behaviour that are appropriate for it; and it has been tested to prove that they behave in ways that are reasonable for the general circumstances and in relation to decisions that are input to the ILE. Relationships in the models are based on typical and realistic real world mechanisms, and there are no random factors or deliberate traps. Of course, the system is still complex and some decisions might not always lead to completely predictable outcomes.

ILE Studio Castellmare allows participants to experience trying to grow a small firm by product penetration. Any session with a simulator is likely to be much more effective if users have a plan of action, a set of experiments they wish to undertake to enable them to search for the best decisions to achieve their goals.

A recommended process for working with the ILEs is:

- Firstly, read the case notes carefully, think about the kind of company it describes and how it is likely to want to grow.

- From the ways that growth might be possible, and the general growth strategy in this unit, focus on the options that are appropriate and feasible.
- Decide on reasonable and realistic growth objectives.
- Then think of the decisions that the firm will have to make to implement a growth strategy to achieve these objectives within these constraints – the ILE is set up only to allow analysis based on reasonable and relevant options.
- At first the user is advised to study the initial parameters given for a base growth case. He or she can think how the parameters fit in with the growth strategy and the kind of outcome resulting from this setting. A first task with the model is usually to run a base case with the original settings.

Comments on the base run and 2 alternative scenarios of ILE1

a) Base run

The simulator provides a basic scenario in which all the policy levers remain constant over time. Understanding the structure behind such scenario is essential for the correct interpretation of why some events occurred in the performance of Studio Castellamare over time.

Under this scenario, the company gains increasing orders of traditional products over time, which are satisfactory fulfilled until the first semester of the second year. The increasing orders result from gaining many customers over time, due to also the marketing efforts which amplify the customer's base of the firm.

The company faces difficulties in shipping the quantity requested by customers as it does not react quickly to changes in the orders and in the expected demand. Thus, the painting and, in particular, the production rates take time to be increased according to the new flow of orders, and consequently they are not enough to fulfil them in time.

This implies an increase in company backlog. As a consequence, a balancing loop begins to limit the growth of the customers' base and the company is at risk of losing customers due to failures of delivering within the expected time. In fact, a higher delivery delay produces a higher number of dissatisfied customers that will not repeat their orders in the future (see figure 3, balancing loop B1: delivery delay effect). This phenomenon can be detected at the end of the fourth year, as the level of customers exhibits a decreasing behaviour.

Here below main company variables resulting from the above commented scenario are reported (see figures 1 and 1).

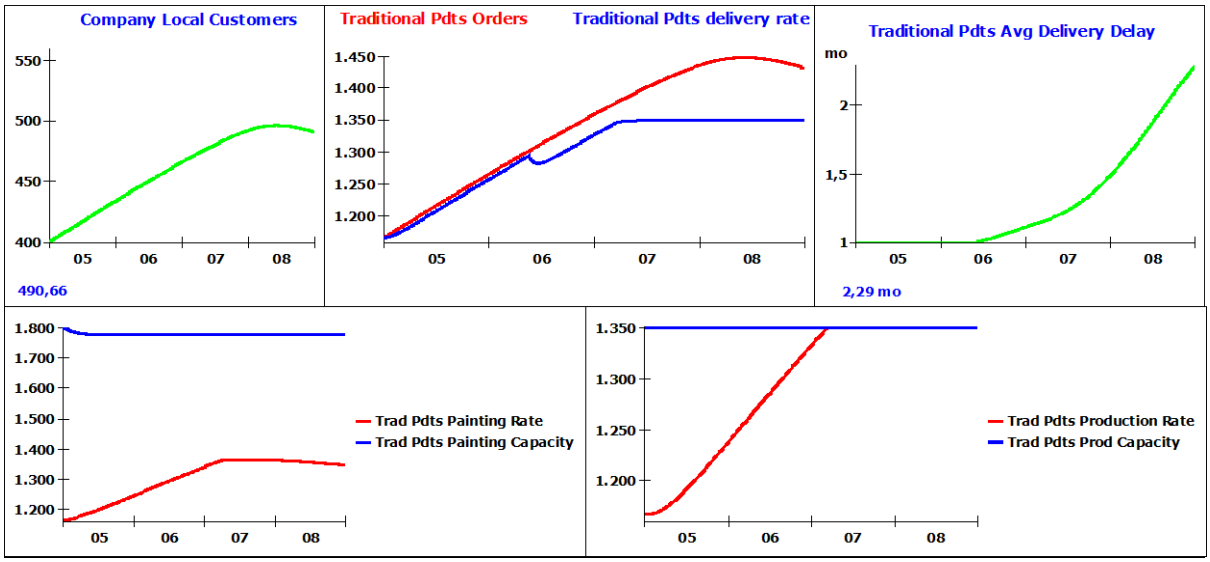

Figure 1 - Main company commercial and production results

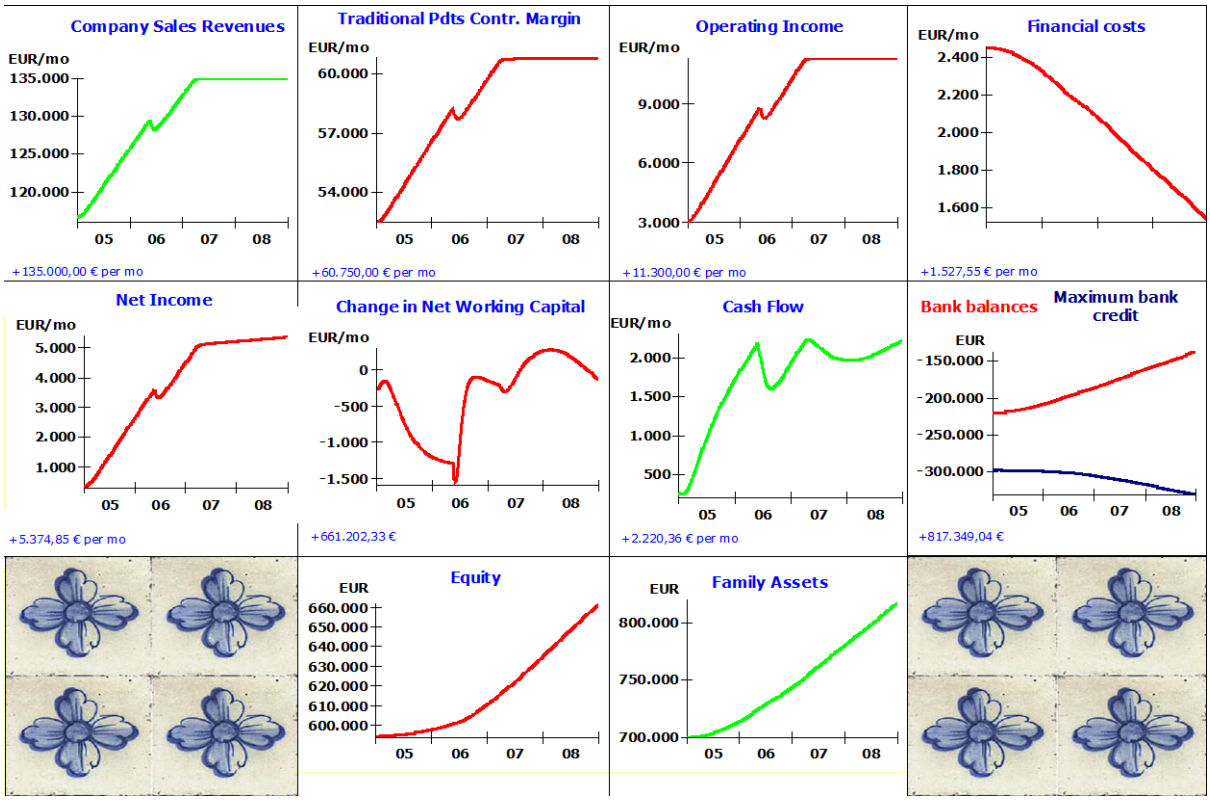

Figure 2 - Main financial results

For the company to grow, some changes in the current values must be implemented. Thus, some alternative scenarios are presented as follows.

c) Scenario: Sustainable Growth Strategy & Low Profitability

In this scenario, a commercial growth strategy is supported by an increase in production capacity. Such a growth is also fostered by a raise in family assets invested to fuel company growth.

In particular, marketing investments are increased up to the sum of 14.000 €/month only after the second year of the simulation. On the production capacity side, a new kiln has been acquired at the

beginning of the second semester. In order to finance such investment, at the same time, the % of new investments financed by equity has been set to 80%.

Outcomes

As results of this strategy, at the end of the fourth year Studio Castellamare recorded about 520 customers (originally 400, a 30% growth rate).

In order to face a higher amount of orders, differently from the base run, the company's production rate is enhanced by a new kiln and consequently the delivery delay shows only a slight increase (see figure 3).

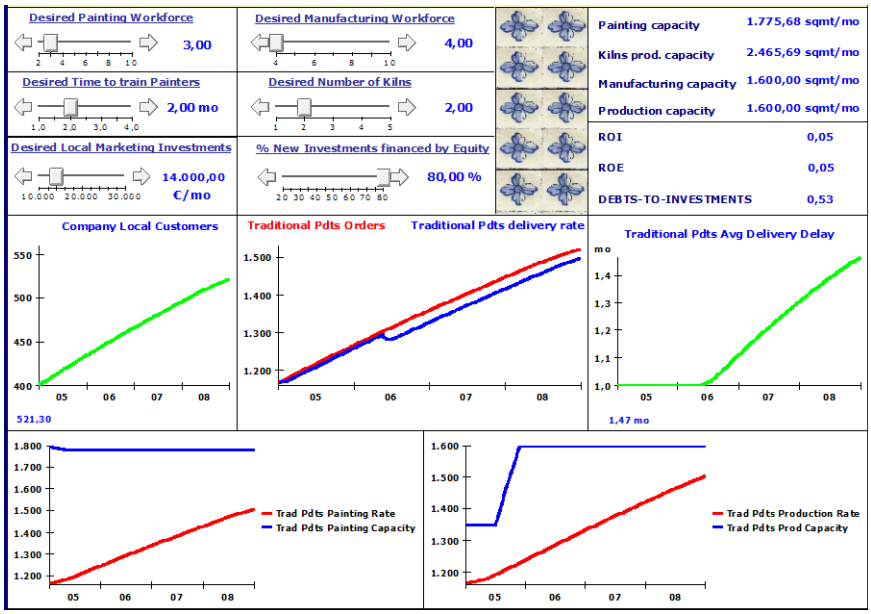

Figure 3 - Main company commercial and production results

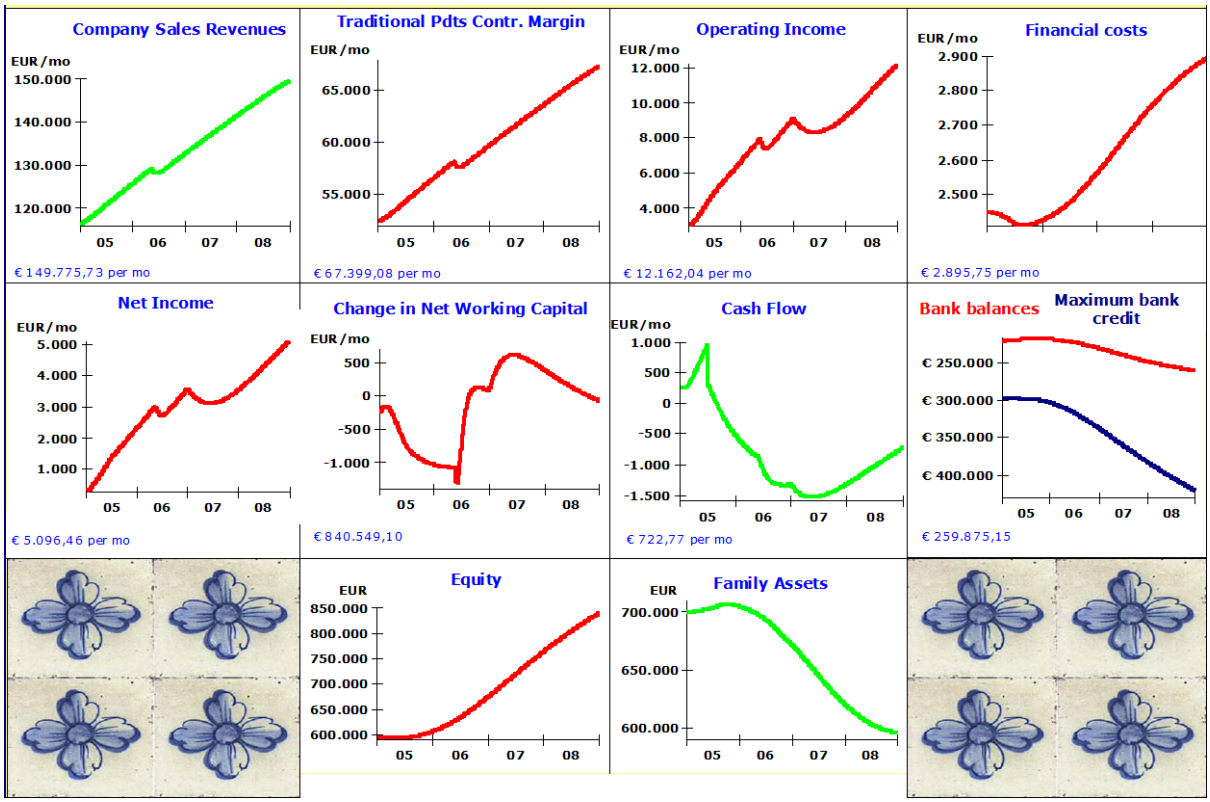

Figure 4 - Main financial results

Figure 4 shows a positive company net income during the all simulation period. During the second and the third year of the simulation, the cash flow is negative due to the high investments done in both the commercial and production side of the company. Such high investments are the main causes of the lower profitability (compared to the base run scenario) recorded by Studio Castellamare at the end of the simulation.

Such financial results may encourage the decision maker to implement this strategy also because "company customers" (a key company strategic asset) shows a promising expansion for the coming years.

In this scenario, it is worth remarking that commercial and production expansion are strongly fuelled through Equity investments (80% of financial needs), as results of the decision to divest Family assets into Studio Castellamare.

Conclusion

Certainly, there are some other scenarios to try out for Studio Castellamare to grow. However, the scenarios presented above suggest somehow that the company has few changes of growing in a sustainable way in the local market with the traditional products. The company might want to start considering alternative growth strategies, such as launching a new product in the local market or exploring new markets.

REFERENCES

Alcorn P. (1982). Success and Survival in the Family-owned Business, McGraw-Hill, New York.

Argyris C. and Schon D. (1978). Organizational Learning. A Theory of Action Perspective, Addison Wesley, Reading Mass.

Ault, T. and Miller, M. (1985). Eliminate Small Business Failures: Twelve Basic Rules, in Electronic Proceedings of the Small Business Institute Director's Association Conference, Boston, 1-11.

Bhide A (1994). How Entrepreneurs Craft Strategies That Work, in Harvard Business Review, March-April, 150-161.

Bianchi C. and Bivona E. (2000) Commercial and financial policies in family firms: The Small Business Growth Management Flight Simulator, Simulation Gaming 2000; 31; 197

Cressy R. (1996). Small Business Failure: Failure to Fund or Failure to Lear by Doing? in Electronic Proceedings of the International Council on Small Business Conference, Stockholm, June 16-19, p.1-7.

Dori Y, Belcher J. 2005. How does technology-enabled active learning affect undergraduate students' understanding of electromagnetism concepts? Journal of the Learning Sciences 14(2): 243–279.

Donckels R. and Frohlich E. (1991). Are Family Businesses Really Different? European Experiences from STRATOS, in Family Business Review n. 2, quoted in: Corbetta G. (1995). Imprese Familiari, EGEA, Milano, 243.

Festervand T. A. and Forrest J. (1991). Small Business Failures: A Framework for Analysis, in Electronic Proceedings of the Small Business Institute Director's Association Conference, Orlando, 1-14.

Forrester J. (1961). Industrial Dynamics, Productivity Press, Portland.

— , (1968a). Principles of Systems, Productivity Press, Portland.

— , (1968b). Market Growth as Influenced by Capital Investment, in Industrial Management Review, MIT, Cambridge, Mass., Winter, vol 9, n. 2, 83-105.

—, (1994). Policies, Decisions, and Information Sources for Modeling, in Morecroft J. and Sterman J. (1994). Modeling for Learning Organizations, Productivity Press, Portland, Oregon, 51-84.

Foster M. (1993). La Pianificazione dello Scenario nelle Imprese di Piccole Dimensioni, in Problemi di Gestione, vol. 20, n. 4, 27-44 (Original title: Scenario Planning for Small Businesses, in Long Range Planning, vol. 26.).

Franklin W. Jr. and Franklin S. Sr. (1982). Five Mistakes Often Made by Small Businesses, in: Journal of Small Businesses, Sept., Vol. 9, 5-6.

Fredrickson J. and Mitchel T. (1984). Strategic Decision Processes: Comprehensiveness and Performance in an Industry with an Unstable Environment, in Academy of Management Journal, n. 27, 399-423.

Gable M. and Topol M.(1987). Planning Practices of Small Scale Retailers, in American Journal of Small Business, 12 (2), 19-32.

Ganguly, P. (1985). UK small business statistics and international comparisons, Small Business Research Trust, Harper Row, London.

Gibb A. and Scott M. (1985). La Pianificazione Nelle Piccole Imprese, in Problemi di Gestione, vol. 17, n. 6, 12-16, (Original title: Strategic Awareness, Personal Commitment and the Process of Planning in Small Business, in Journal of Management Studies, vol. 22, n.6, Nov).

Goffee R. and Scase R. (1980). Problems of Managing Men, in Small Business Guardian, Vol. 3, 63-78.

Groesser, S. (2006) Reflections about Interactive Learning Environments: A Multi-Perspective Approach, 24th International System Dynamics Conference, Nijmegen July

Gumpert D. and Boyd D. P. (1985). The Loneliness of the Small-Business Owner, in: Harvard Business Review, Vol. 7, 36-54.

Hutchinson P. and Ray G. (1986). Surviving the Financial Stress of Small Enterprise Growth, in Curran J and Stanworth J and Watkins D. (editors) The Survival of the Small Firm, Vol.1, Gower, Brookfield, 53-71.

Jones W. (1982). The Characteristics of Planning in Small Firms, in Journal of Small Business Management, 20 (3), 15-19.

Kim E, Pak S. 2002. Students do not overcome conceptual difficulties after solving 1000 traditional problems. American Journal of Physics 70: 759–765.

King A. 1993. Fromsage on the stage to guide on the side. College Teaching 41(1): 30–35.

Marchant K. (1998) Modern Management Control Systems. Text and Cases, Prentice Hall, Upper Saddle River, New Jersey, USA, 727-758.

Lamberson M. (1995). Financial Analysis and Net Working Capital Management Techniques Used by Small Entrepreneurs: Survey and Analysis, in Electronic Proceedings of the Small Business Institute Director's Association Conference, Seattle Washington, 1-10.

Landstrom H. and Winborg J. (1995). Small Business Managers' Attitudes Towards and Use of Financial Sources, in Frontiers of Entrepreneurship Research, Proceedings of the 15th Annual Conference, UK, Vol. 1, 172-186.

Lasry N, Mazur E, Watkins J. 2008. Peer instruction: from Harvard to the two-year college. American Journal of Physics 76(11): 1066–1069.

Lyneis J. (1980). Corporate Planning and Policy Design. A System Dynamics Approach, Pugh Roberts Ass, Inc., Five Lee Street, Cambridge, Massachusetts, 359.

Lumpkin J. and Ireland D. (1988). Screening Practices of New Business Incubators: The Evaluation of Critical Success Factors, in American Journal of Small Business, Vol. 12, No. 4, Spring, 27-45.

Lussier, R. and Corman, J. (1995). There are Few Differences Between Successful and Failed Small Business, in Electronic Proceedings of the Small Business Institute Director's Association Conference, Seattle Washington, 1-19.

Mintzberg H. 2005. Managers, Not MBAs. Berrett-Koehler: San Francisco, CA.

Merikas A. and Bruton G. and Vozikis G. (1993). The Theoretical Relationship Between the Strategic Objective of Sales Growth and the Financial Policy of the Entrepreneurial Firm, in International Small Business Journal, 11 (3), 59-67.

Milliiken F. (1987). Three Types of Uncertainty about the Environment: State, Effect and Response Uncertainty, in Academy of Management Review, n. 12, 133-143.

Mintzberg H. (1973). Strategy-Making in Three Modes, in California Management Review, n. 16, 44-53.

Morecroft J. Executive Knowledge, Models and Learning, in Morecroft J and Sterman J. (1994). Modeling for Learning Organizations, Productivity Press, Portland, Oregon, 3-11.

Olivera H. and Martin C. (1993). Accounting Problems Encountered in Small Business Failures, Electronic Proceedings of the Southwest Small Business Institute Association, Annual Conference, New Orleans, March, 1-8.

Olson P. and Gough N. (1996). The Planning-Performance Relationship in Small Firms: Past Research and Future Suggestions, in Electronic Proceedings of the Annual National Conference United States Association for Small Business and Entrepreneurship, Atlanta, Georgia, Jan, 1-18.

O' Neil H. and Duker J. (1986). Survival and Failure in Small Business, in Journal of Small Business Management, vol. 21, n.1, 52-64.

Perren L. (1997). The Growth of Micro-Enterprises. In Proceedings of the 20th ISBA (International Small Business Association) National Conference, Belfast, November, Vol. 1, 274-294.

—, (1999) "Factors in the growth of micro-enterprises (Part 1): developing a framework", Journal of Small Business and Enterprise Development, Vol. 6 Iss: 4, pp.366 – 385

Pfeffer, J. and C.T. Fong. 2002. The End of Business Schools? Less Successthan Meets the Eye. Learning and Education 1 (1):78-95.

Richardson G. and Andersen D. and Maxwell T. and Stewart T. (1994), Foundations of Mental Model Research, in Proceedings of the International System Dynamics Conference, Stirling, Vol. 1, 181-192.

Robertson M. (1994) Strategic Issues Impacting on Small Firms: Their Promise, Their Role, Their Problems and Vulnerability, Their Future and the Way Forward, paper presented at the 17th National Small Firms' Policy and Research Conference, London, 17-34.

Robinson R. and Pearce J. (1984). Research Thrusts in Small Firm Strategic Planning, in Academy of Management Review, 9 (1), 128-137.

Schulze W. and Dino R. (1998). The Impact of Distribution of Ownership on the Use of Financial Leverage in Family Firms, in Electronic Proceedings of the U.S. Association for Small Business and Entrepreneurship Conference, Clearwater, January, 1-30.

Senge P. (1990). The Fifth Discipline, Century Business, London.

Sterman J. Sterman J. (1988). People Express Management Flight Simulator (updated version). Available: http://www.strategydynamics.com/microworlds/people-express.

—, (1994). Learning in and about Complex Systems, in System Dynamics Review, no. 10, 291-330.

—, (2000). 2000. Business Dynamics: Systems Thinking and Modeling for a Complex World. Boston: McGraw-Hill.

—, (2014). Interactive web-based simulations for strategy and sustainability: The MIT Sloan LearningEdge management flight simulators, Part I, in System Dynamics Review, vol 30, No 1-2 (January-June 2014): 89–121

Storey D.J. (1994) Understanding the Small Firm Sector, Routledge, London.

The Dan and Bradstreet Business Failure Record (1981). Dan and Bradstreet Inc., New York.

Torres D. and Anderson K. (1994). The Effects of Growth on Financial Performance of Small and Medium-Size Businesses: Implication for Strategy, in Electronic Proceedings of the 18th National Small Business Consulting Conference, San Antonio, February 2-5, 1994,, 1-11.

Van Hoorn T.(1979). Strategic Planning in Small and Medium Sized Companies, in Long Range Planning, 8 (2), 84-91.

Vennix J. (1996). Group Model Building, Wiley.

Winch G. (1993). Consensus Building in the Planning Process: Benefits From a “Hard” Modeling Approach, in System Dynamics Review, vol. 9, n. 3, 287-300.