Opportunities and pitfalls related to internet-based strategies in small and medium-sized firms – A system dynamics approach

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E-commerce is often perceived as a powerful lever to foster SMEs growth. However, both the literature and empirical evidence have been showing the perils hidden in superficial decision making by SME entrepreneurs. A System Dynamics (SD) approach is used in this paper to demonstrate how managing strategic assets accumulation and depletion processes, detecting inertial effects of decisions made in the past, and selectively acting on policy levers are likely to help entrepreneurs in understanding opportunities and pitfalls related to e-commerce strategies.

A feedback analysis of three case-studies selected from the literature and the main findings from a survey conducted by the authors on SMEs pursuing e-commerce strategies are discussed in the paper. Based on the insights developed through this analysis, the last section of the paper shows a generic SD model aimed to support entrepreneurs to better understand strategic assets accumulation and depletion processes in SMEs' e-ventures.

Introduction

In the last decade, e-commerce has been used as an important lever to foster business growth. In fact, it has allowed firms to pursue global strategies, establish a direct relationship with end-consumers, shorten logistic channels and broaden potential markets.

Many successful stories spread out through the management literature (Drennan, Kennedy 1999, Easton 1999, Lowry et al. 1999, Tsai 1999) and the press have been encouraging a growing number of small-medium enterprises (SMEs) to start e-commerce ventures in order to increase sales turnover. However, not always such ventures have allowed SME entrepreneurs to achieve their intended results. In fact, different surveys have demonstrated a high mortality rate of small businesses web sites.

What are the causes of such phenomenon? What are the decision making processes underlying growth-oriented e-commerce strategies undertaken by SMEs? What are the main risks an SME entrepreneur faces, e.g., concerning production capacity adjustment, financial policies related to investments in web site development and maintenance, as well as to net working capital associated to sales growth? What competencies should be built by an SME to manage its web site and to maintain a stable image? How does an entrepreneur perceive the above variables? What policy levers does he/she use to pursue Internet-based growth strategies? How are delays and non-linearities perceived?

In order to explore the above issues, the authors started a research project based on the following stages:

1) Analysis of the management literature and investigation of related case-studies on the field through a feedback perspective, aimed to build qualitative System Dynamics (SD) models (Forrester 1961, Sterman 2000)
2) Design of a field survey, aimed to test the assumptions developed in the previous stage

3) development of a generic SD simulation model (1), based on the insights from stages 1 and 2
4) test of the generic SD model on the surveyed companies.

The research is still in progress: to date the generic SD model has been built and will be later applied to the firms participating to the survey.

This paper aims to outline the findings generated so far from the first three stages. In order to provide a general framework to our study, the main critical success factors of SMEs' e-commerce strategies emerging from the relevant literature are initially outlined. Then, a qualitative feedback analysis of three case-studies from the literature is presented. Such an analysis aims to depict the main forces driving the building and draining processes associated with strategic assets (Amit, Schoemaker 1993, Dierickx, Cool 1989) (2) in e-commerce growth strategies. A base run of the generic SD simulation model, based on the qualitative analysis and the field survey, is finally discussed. The main research findings and implications for further research are summarised.

One of the main issues emerging from our study is the difficulty of entrepreneurs to timely perceive limits to growth arising from the lack of strategic assets. Although this phenomenon can also be detected in larger enterprises, it is particularly critical in smaller firms. In fact, quite often SMEs face structural difficulties in pursuing Internet-based strategies, due to their own specific complexity features, such as (Bianchi, Bivona 2000):

· lack of professional management
· weak information and management control systems
· decision making processes mainly based on 'flair for business' and gut-feeling
· lack of equity and financial resources
· a weaker competitive position against larger firms.

Flaws in owner-entrepreneur's mental models and the lack of a professional team and management control tools can be primary causes of weak decision making, leading to uncontrolled growth and unexpected crisis. For instance, delays in invoicing or deficiencies in handling growing volumes of data can be a primary cause of longer sales collection delays and higher costs (see cases 1 and 2 later discussed). Likewise, an increase in sales orders generated by aggressive commercial policies (e.g. web site promotional investments) can give rise to bottlenecks in production and shipping, leading to a gradual rise in delivery delays (see case 3). Such phenomena generate a slow and gradual depletion in business strategic assets (e.g. customer base and business image), which cannot be financially measured, owing to the weakness in conventional management control tools (Bianchi, Winch, Gray 1998).

SD modelling can support decision makers in understanding the dynamics of such resources, as a result of a learning process through which it is possible to better frame the relevant system and question the consistency of mental models (Morecroft 1994, Sterman 1994).

Case 1: Ask The Builder

In December 1995 a professional builder and remodeller, Tim Carter, started to dream the idea to open a web site to supply customers professional advice, tips and resources

related to home improvement. For this reason, he decided to launch *Ask The Builder* (Easton 1999, chapter 1), a micro-firm financed through a line of credit he established on his house.

Some years before starting the firm, in order to contact new customers, Carter used to advertise his professional advice through newspaper columns. However, he felt that a larger potential market, and quicker and direct contact with the public could have been reached through the Web.

Although two main products were sold through the web site, the main source of income for the company was related to revenues from banners sold to building companies.

A first problem faced in the start-up stage was related to the web site design and set up. Because of the lack of available financial and human resources, Carter decided to ask for the support of two consultants. This allowed him to develop new skills in web site design and maintenance, so that later he was able to give up home improvement consulting services.

Different media were used to advertise *Ask The Builder* web site, in particular through newspaper articles and frequent Carter's appearances in print and on TV. In a few months, the number of web site visitors started to exponentially grow up to 12 000 pages viewed per month. Carter feels that the success of his site is not related to the number of visits, but is due to the personal contact he has been establishing with clients. He receives on average more than 50 messages per day. This is a very time consuming activity for Carter, who strongly believes that customised and detailed responses are a powerful lever to foster customer loyalty. Most of the queries received by Carter are highly detailed communications requiring careful replies.

When *Ask The Builder* was started, Carter used to check his mailbox, on average, once a day. Two years later, due to web site traffic increase and banner advertising requests, he was forced to check e-mails every 90 minutes.

Such a phenomenon may disclose a potential problem, as Carter – being supported by only part-time staff – was finding it more and more difficult to manage time. This could be a threat for the company in the future, provided that prompt and customised reply is a critical success factor. An implication of this is that further growth in activity volumes could be sustainable in the future only through the acquisition and training of human resources able to fulfil the same tasks actually performed by Carter.

What are the driving forces of business growth? What symptoms will allow the entrepreneur to promptly discern limits to growth?

If we analyse the firm as a system of strategic assets, i.e. as a coherent body of production factors providing the basis of competitive advantage, we can describe business growth through feedback loops affecting resource dynamics over time. Each strategic asset, depicted as a stock, is likely to change over time as it is influenced by flows. Such flows are originated by business policies aimed to deploy a given endowment of currently available resources. For instance, the acquisition of new customers (stock variable) depends on the allocation of human resources time available (stock variable).

According to the SD methodology, it is possible to depict main feedback loops fostering and tackling *Ask The Builder's* growth, as in figure 1.

The outer loop captures the growth process pursued by the company. Web site set up and promotion investments allow Carter to provide clients a satisfactory service. The initial customer base generates a word-of-mouth effect leading to a further increase in business customers. The higher customers level fosters the sale of banners, which increase cash flows that can be reinvested in further web site improvements.

However, in the medium term, the above increase in customer base will affect business service. In fact, the higher number of queries Carter has daily to deal with, gradually reduces the average time devoted to each customer. Although this phenomenon is currently insignificant and is not perceived either by clients or by Carter, it is likely to generate a limit to growth and subsequent collapse, as it would reduce the customer acquisition rate and, consequently, the customer base (figure 2).

How will the firm be able to face the above limits to growth? What strategic assets will the company have to build in order to counterbalance such limits?

The main strategic asset tackling growth is related to skilled human resources. The acquisition of such resources is tied to the availability of other resources, such as financial assets and entrepreneur's time to deal with customer queries (figure 3). Even though in this case, financial resources are not a significant problem, provided that banner revenues are a major source of cash flows, entrepreneurial time is the scarce resource that will be likely to limit further growth. As a matter of fact, in the short term, a progressive allocation of Carter's time to train new employees will reduce even more the time he will devote to handle customer queries, that will decrease the level of service. However, in the longer run, new trained staff will be able to support Carter to overcome the above limit to growth, through service improvement leading to further development of the business (figure 4).

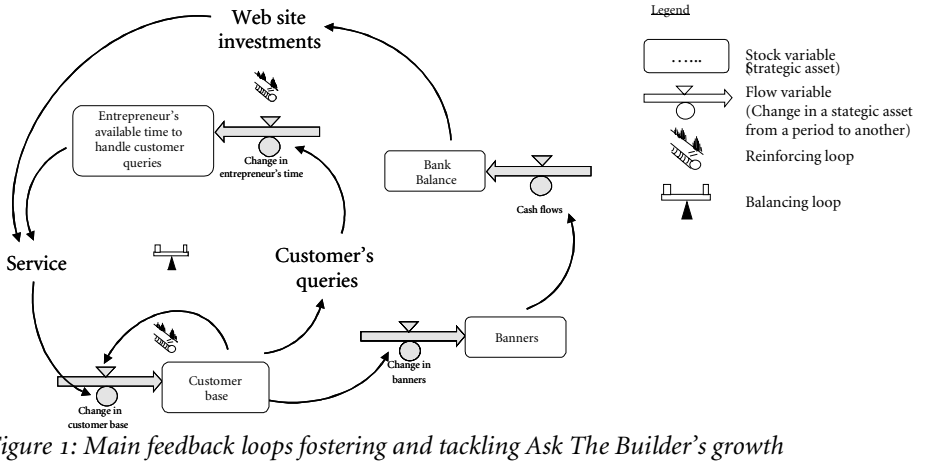

Figure 1: Main feedback loops fostering and tackling Ask The Builder's growth

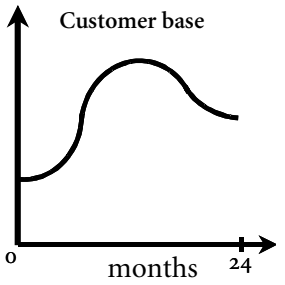

Figure 2 : Customer base dynamics

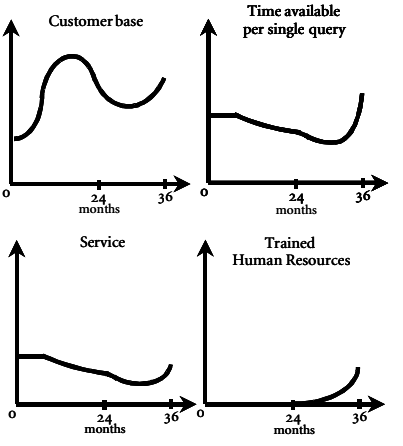

Figure 3: Effects of human resource policy on business growth

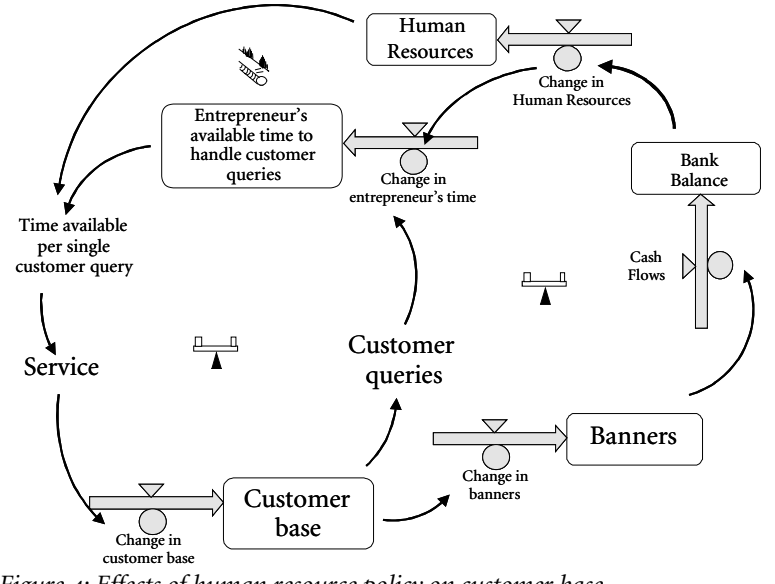

Figure 4: Effects of human resource policy on customer base

From the above analysis, it is possible to argue that SME entrepreneurs ought to:

- Develop an attitude to perceive weak signals of change (Ansoff 1975) affecting the dynamics of strategic assets
- Acquire a mind-set oriented to figure out short and long term effects arising from adopted policies. They must be aware that the attainment of satisfactory results in the long run can be often achieved by only worsening short term results, and vice-versa
- Adopt a feedback view of strategic assets, in order to assess sustainable business growth policies.

Developing an attitude to timely perceive weak signals of strategic change is crucial for SMEs' survival and growth. In fact, as remarked in the introduction, owner-entrepreneurs are not usually supported by a professional management; this forces them to simultaneously deal with current and strategic issues.

The above attitude is particularly significant when strategic surprise may arise from the bundle of current activities, rather than specific long term projects. In fact, monitoring strategic relevance of current events often implies major difficulties in detecting in advance weak signals of change, as they are usually hidden in a wider range of daily occurrences in which decision makers are fully involved.

Case 2: Coastal Tool & Supply

In October 1995, Robert and Karen Ludgin started *Coastal Tool & Supply* (Easton 1999, chapter 3), an e-commerce company selling tools like drills, saws, routers, sanders, polishers, rotary and demolition hammers and others for home improvement.

To start the company web site, they hired Todd Mogren, a 36 years old with a computer background in database management and a love of home hardware. Although the business owners are Robert and Karen, Todd can be considered the entrepreneur, as he is in charge of the most significant decisions impacting on the company's growth.

The business mission is to provide clients a wide product scope at a competitive price and online assistance. Consequently, when *Coastal Tool & Supply's* web site was designed, Todd focused on two major goals, i.e.: a friendly interface and a standard layout and a fast and easy purchasing process.

Todd's slogan is *Three-Clicks-to-Buy:* as a business policy any customer should be able to add-to-cart within three mouse clicks. This makes more comfortable the selling process, likewise in real shops. As the number of items at the site continuously grows, Todd always checks to see whether the *Three-Clicks-to-Buy* holds true. This is a very crucial aspect for the business growth management.

The quality of business offer is also enriched by a service package, such as: free counselling to clients on the kind of tool to choose according to specific needs, and a wide and diversified database including past answers to client queries.

From 1996 to 1997, such an offer allowed the firm to increase its sales revenues by 474% and in 1998 to earn a profit higher than US$ 1.5 million. However, the business start-up was not easy; in fact, the first order was received only after six months from the web site opening. Surprisingly, the slow start did not worry Todd. As a matter of a fact, he was aware of the huge potential market that the Internet would have allowed the firm to reach.

On the contrary, he was astonished by the enormous workload generated by sales orders management (3). This activity does not only imply an administrative and physical order handling, but also concerns a personal contact with each customer. This is a very critical task, provided that each visitor receiving a satisfactory reply to his query will certainly send a purchase order (4).

In order to increase the web site traffic, the company has been acting on other policy levers aimed to build up two important strategic assets:

1. a network of reciprocal links with other companies operating in similar industries, and
2. an electronic mailing list, including about 20000 addresses, to which a monthly newsletter is sent.

Through the mailing list, the company has increased customer loyalty as a consequence of a higher perceived service quality. Another effect generated by the mailing list is related to the revenues provided by newsletter banners sold.

A side effect of the growing number of items embodied in the web site (about 4000) is the increase in inventory. In this regard, Mogren is not concerned about the higher financial costs related to inventories or available warehousing space; he is worried, instead, by the time needed to handle the volume of items offered in the web site.

An analysis of the opportunities and pitfalls related to *Coastal Tool and Supply's* e-commerce strategies can be supported by a feedback view of building and draining processes affecting its strategic assets.

A reinforcing loop underlying business growth can be related to the accumulation of new items in the product portfolio of the firm. In fact, an increase in the scope of items sold leads to a higher average order per client. As a consequence, both cash flows and – other things being equal – bank balance increase. An improvement in the company liquidity fosters a further increase in the scope of items sold (figure 5).

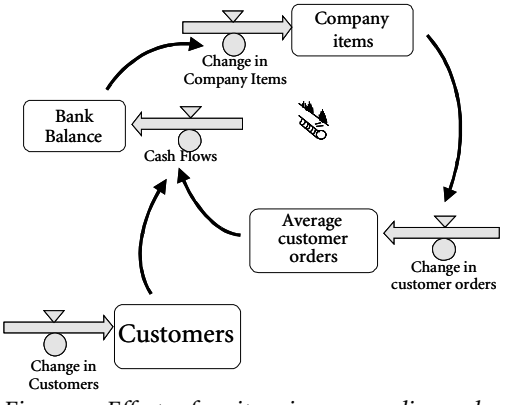

Figure 5: Effects of an item increase policy on business growth

Figure 6 depicts other reinforcing loops fostering business growth, which are related to commercial policies aimed at increasing the number of visitors, perceived web site quality and to foster customer loyalty.

The progressive growth in Todd's personal contacts with web site owners selling similar products, generates a higher new company visitors rate. The stock of company visitors (i.e. people interested to buy company items) is another strategic asset critical to business growth. In fact, visitors influence business performance in two different ways:

1. they generate a critical mass of traffic which makes the company's web site more attractive for new reciprocal links with other sites,

2. they give rise to a higher volume of queries, leading to a larger database. This increases the site's perceived quality, generates new customers and enlarges the customer base. A higher customer base fosters, through word-of-mouth, an increase in web site visitors, leading to further growth.

A minor balancing loop may impact on web site visitors. In fact, an increase in new customers caused by higher perceived site quality reduces the pool of visitors, if the inflow of new web site visitors is lower than the outflow.

The draining effect generated by the balancing loop can become more significant if the positive loop associated to the word-of-mouth phenomenon is weakened by a lower perceived web site quality, due to better services provided by competitors. In fact, this can give rise to a higher customers lost rate, which reduces the customer base.

In order to tackle such threats, Todd fosters customer loyalty inducing clients to subscribe the mailing list. The larger the number of addresses stored is, the stronger the effect of the newsletter on customer loyalty will be.

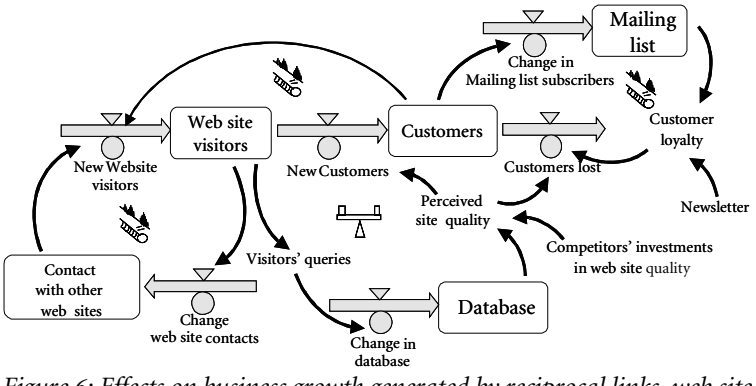

Figure 6: Effects on business growth generated by reciprocal links, web site quality and customer loyalty policies

The dynamics generated by the feedback loops commented above are depicted in fig. 7.

What pitfalls can be related to Coastal Tool & Supply future growth?

Further growth could be tackled by other strategic assets, such as, for instance, time devoted by company personnel per company item and business liquidity.

In fact, the more items are offered the more will be the time needed to update the company web site. If the firm will not increase its endowment of human resources, the average time devoted to give advice on each item will decrease. As a consequence of this, the perceived site quality will drop, leading to a reduction in the flow of new customers and – other things being equal – in sales revenues and cash flows (lower balancing loop in figure 8).

Another limit to growth could arise from the higher financial needs due to the inventory increase that a broader product portfolio would imply. Both the inventory increase and the related higher financial costs would reduce cash flows, thereby dampening business growth (upper balancing loop in figure 8).

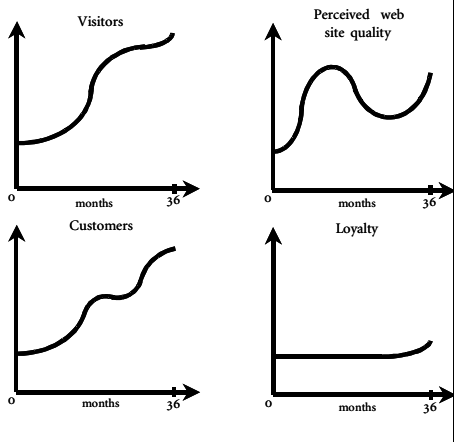

Figure 7: Limits to growth and further expansion generated by perceived web site quality and customer loyalty

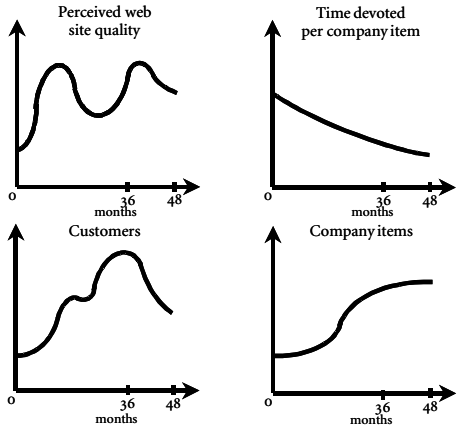

Figure 9: Limits to growth generated by time devoted per company item and business liquidity

Figure 9 portrays the behaviours associated to the limits to growth commented above.

Because of the several delays (e.g., related to perceived site quality or word-of-mouth effects) affecting the dynamics of the strategic assets, the above described system is characterised by inertial effects. Provided that the current stock levels are the result of concurrent effects produced by past decisions, the above dynamics could be considered as counterintuitive and difficult to understand in the light of static and linear decision makers' mental models (Sterman 1994).

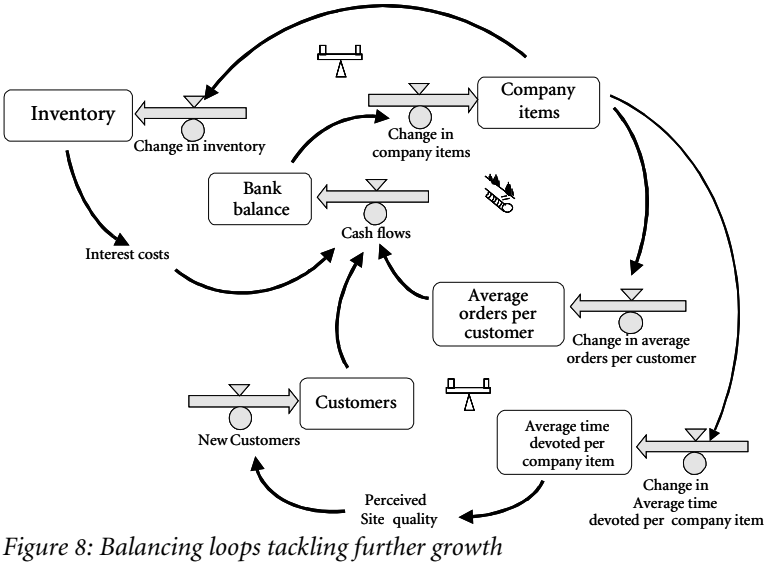

Figure 8: Balancing loops tackling further growth

Case 3: Movity

In November 1995, Angelo and Maria Di Francesco and Carlo Brighi started *Movity*, a firm producing highly innovative electric vehicles. The product was designed to be light, noiseless and environmental-friendly. Initially *Movity* produced two and three-wheel scooters (*superMono* and *Mandy*) and a larger model, equipped with a small chair (*Walky*). The product was sold to airports, railway stations and other firms which needed to quickly and cheaply move people or goods from one place to another. Based on the quality/price ratio, the product was positioned in a medium-high market segment.

Carlo was in charge of commercial activities, Angelo and Maria were respectively devoted to product design and purchasing/production. Carlo acted as the entrepreneur, the other two partners did not devote much time to strategic decision making, and the firm did not rely on a professional management.

In order to overcome the lack of sensitivity of the domestic market towards business environmental responsibility, the firm started an internationalisation process and opened a web site. The entrepreneur began travelling all over the world to contact potential end-consumers and distributors. The web site opening not only contributed to increase the company visibility, but also provided new customers from Internet 'surfers'.

In 1997, the firm signed an important commercial agreement with *Zap Power System*. This allowed it to significantly increase sales revenues, from US$ 35 000 in 1995 to US$ 400 000 in 1996. Staff employed in the production area also increased from 4 to 25 people.

As the factory was relatively small, Angelo and Maria tried to rationalise available space, both in production and inventory processes. While component parts were received from outside suppliers, the scooters were designed and assembled inside the factory.

The entrepreneur's goal was to become a first-in-class competitor in the world, to increase sales volumes in order to saturate available production capacity. To reach this goal, he was inclined to accept any new order from different countries, although it might have required a higher product customisation aimed to fulfil the various law prescriptions. About the 95% of production was sold abroad, mainly to Japan, USA, Singapore, Malaysia and different European countries.

In the middle of 1997, perhaps nobody could have imagined that the firm would have gone bankrupt!

How can one explain that such a high growing business would have collapsed?

The main cause of business failure was the lack of standardisation in sales orders accepted by the entrepreneur, who did not care for production capacity constraints. Consequently, although he was prone to guarantee clients a reliable delivery delay, he was forced to postpone the shipment of products sold because of unmanageable production problems.

The gradual rise in delivery delays generated two main side effects:

1. financial shortages, due to delayed invoicing and sales collection, and

2. eroding business image, which in turn affected product demand.
In spite of the above difficulties, Carlo was confident to honour business commitments, even though payments to suppliers and shipments would have been slightly postponed.

Unfortunately, it happened that the slow and progressive erosion in business image negatively affected the relationships with suppliers, customers and banks, leading to a deep insolvency state.

The above depicted phenomena generated an unbearable burden that finally Carlo was not able to sustain. His autonomy in managing the company – initially perceived by him as a strength – became a primary factor of loneliness.

Figures 10, 11 and 12 depict the main feedback loops underlying *Movity*'s growth and decline processes.

Figure 10 shows how an increase in business contacts, resulting from promotional efforts and initial web site investments, increases sales orders as well as – and other things being equal – shipments and cash flows. Higher bank balances allow the company to improve web site quality and to increase business contacts. This improves image and leads to new contacts and further growth.

In a longer time horizon, the progressive growth in business contacts generates a higher internationalisation level of the company. This phenomenon, matched with uncontrolled commercial policies, reduces sales orders standardisation, which increases delivery delays. Consequently, shipments and cash flows decrease, and generate a lack of financial resources to self-finance web site improvement (balancing loop in figure 11).

From the above analysis it is possible to argue that, in order to prevent crisis and effectively manage growth, the entrepreneur ought to timely perceive weak signals of change. In the *Movity* case-study both the business control system's sensitivity and the entrepreneur's mental models were not able to detect warning signals related to the above phenomena.

Figure 12 illustrates feedback loops leading to *Movity* failure.

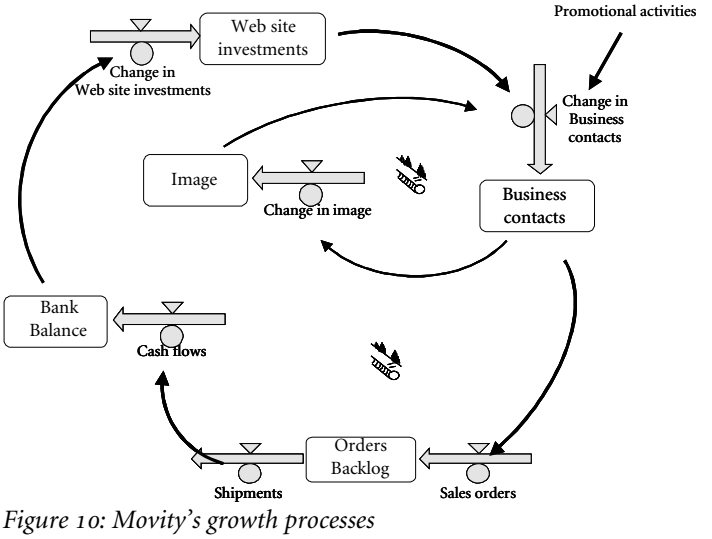

Figure 10: Movity's growth processes

Lack of prompt perception of the balancing loop tackling growth, related to delivery delay effects, leads the company to strengthen investments in web site and promotional activities, aimed to foster a further expansion of business volumes. Such a policy increases, on the one hand, sales orders and cash flows. However, on the other hand, it also gradually leads to a further rise of delivery delays recognised by the market. When such delays cannot be tolerated anymore by clients, business image declines. This reduces business contacts and sales orders, and leads to financial crisis.

The feedback loops discussed above provide a system structure from which the dynamics portrayed in figure 13 originate.

What can an entrepreneur learn from the three case-studies analysed above?

In order to properly manage SMEs growth and decline processes in e-commerce ventures, it is necessary to:

- Develop an attitude to promptly perceive weak signals of changes affecting the dynamics of strategic assets (e.g. decreasing time to handle customer queries, rising competitors investments in web site quality, declining product standardisation)
- Frame short vs. long-term effects generated by adopted policies (e.g. effects of customer base dynamics on human resource policy, rising financial needs caused by increasing company items)
- Detect reinforcing and balancing loops affecting strategic assets' dynamics, in order to strengthen those enhancing growth and weaken those limiting it (e.g. positive loop in figure 5 and negative loops in figure 8)
- Understand that the dynamics of strategic assets is difficult to perceive and affect, mainly due to their intangible nature and inertial effects generated by delays and non-linearities.

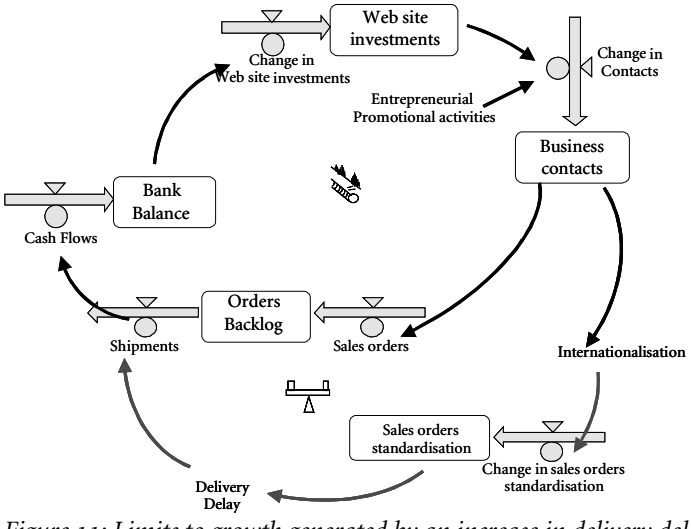

Figure 11: Limits to growth generated by an increase in delivery delay

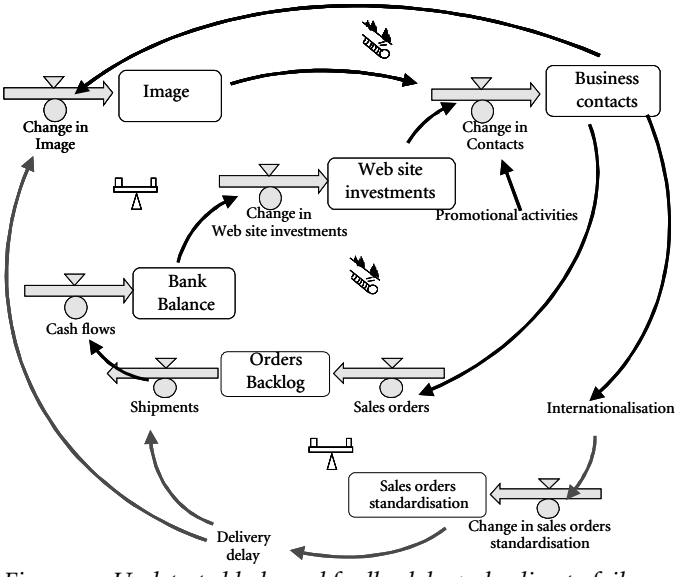

Figure 12: Undetected balanced feedback loops leading to failure

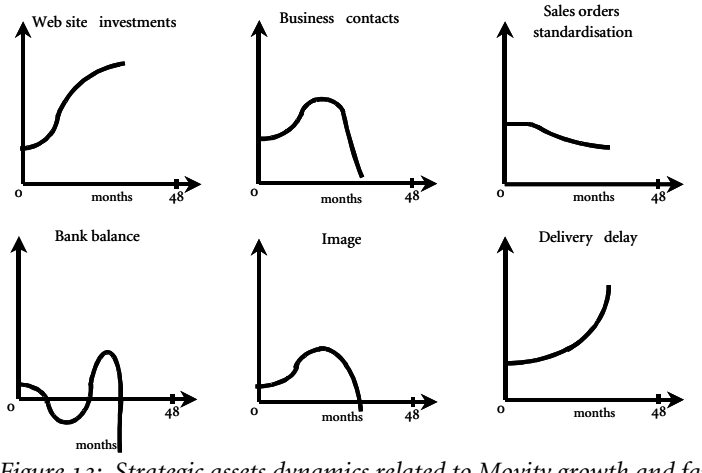

Figure 13: Strategic assets dynamics related to Movity growth and failure

Overview of a survey conducted on smes pursuing e-commerce strategies and related summary results

In order to test the assumptions emerging from the case-study analysis, we conduced a survey of 200 SMEs, mainly operating in Italy in various industries, ranging from food to handcraft, fashion to services, etc. Companies have been selected from databases available in portal web sites and entrepreneurs' associations of different provinces. Provided that the survey has been focused on businesses selling their own products or services through the Internet, portals have not been included in the sample.

Two different questionnaires (5) aimed to both detect decision makers' perceptions about key management areas and recurring problems associated with SME's e-commerce ventures were sent by e-mail to the surveyed companies in two sequential steps. Forty companies from different industries replied to the first questionnaire. Only eight of them returned the second questionnaire. Data from these companies have not only been gathered through the questionnaires, but also through on-site and phone interviews with entrepreneurs and other business decision makers.

Although the selected sample is not statistically representative, it allowed us to get more insights on how the e-commerce phenomenon is faced by small business entrepreneurs and collaborators.

About 70% of interviewed entrepreneurs started their e-commerce venture to support their own existing activities, mainly focused on domestic markets and traditional distribution channels. Most of them perceive that e-commerce can better support their own companies to undertake globalisation strategies without incurring prohibitive investments for SMEs. Many of them also complain about the lack of proper resources (e.g., information and control systems, management, capital) and the low propensity of their increasing web site visitors to buy the company products or services (6).

Quality and customer service have been mentioned as most important levers on which to act in order to be successful in e-commerce ventures. However, advertising and information systems are also considered as powerful levers.

Furthermore, managing customer relationships (e.g., handling e-mails) and searching for new contacts in the competitive system (e.g., establishing partnerships with competitors, suppliers or investors) have been indicated by interviewees as activities to which they are used to devote most of their time.

The survey findings strengthened our original assumptions and supported us to build a generic SD simulation model aimed to provide SME entrepreneurs a viable tool to explore alternative scenarios in e-commerce ventures.

A generic SD simulation model to analyse growth and decline processes in SMEs pursuing e-commerce strategies

A generic SD simulation model has been built in order to capture those most relevant issues that emerged from the case-study and field analysis. In order to be applied into the surveyed companies, the model embodies an input window which allows decision makers to calibrate it on the specific context where they operate. The input window includes 4 sections, such as: market (e.g. number of visitors who browsed the site in the last year, demand sensitivity to delivery delay and post-sale assistance), commercial (e.g. search engine subscription unit cost, company and main competitors product unit price), finance (e.g. web site capitalised costs) and internal processes (e.g. number of employees managing queries).

The simulation model has a time horizon of 200 weeks (7).

The SD model (8) outlines the building and draining processes affecting the dynamics of the main strategic assets in a company undertaking e-commerce strategies. Such strategic assets (e.g. occasional visitors, visitors, visitors willing to buy, customer base,

mailing list) have been defined according to the results of the case-study and field analysis.

Figures 14 and 15 show the main feedback loops, key-variable dynamics and decisions associated with a base run of the model. Main policy levers affecting the dynamics of visitors and customers are: search engines, promotional investments, sale price, product scope and post-sale assistance.

The base run shows that a product scope enlargement, supported by investments in search engines, advertising, web site and personnel, is likely to foster an increase in new visitors, leading to higher customers and a rise in orders and cash flows. This, in turn, provides funds to finance further growth. The above reinforcing loop in figure 14 is strengthened by two other major feedback loops. One of them is related to the mailing list effect, which reduces the flow of customers lost. The second feedback loop refers to the word-of-mouth effect generated by existing customer base, leading to a further acquisition of occasional visitors, providing a source for new visitors and customers.

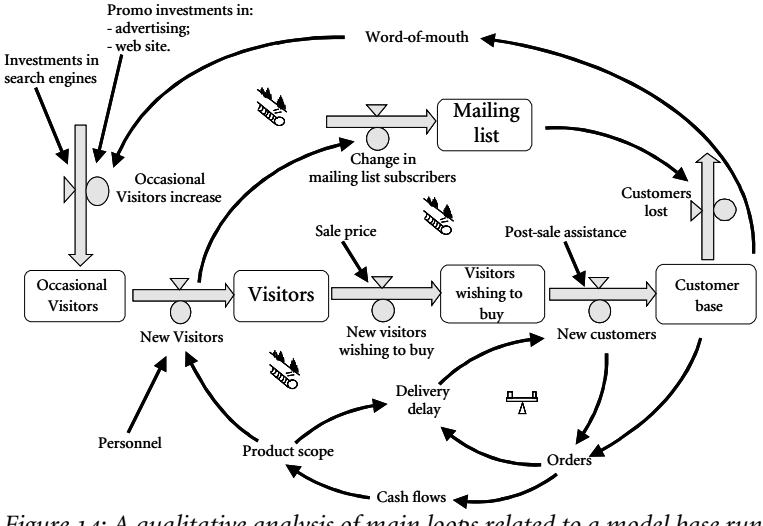

Figure 14: A qualitative analysis of main loops related to a model base run

A side-effect produced by an increase in product scope gradually generates difficulties in inventory and purchase orders management. This leads to higher delivery delays and a decrease in new customer acquisition (9). Such phenomenon causes a decline in sales orders and cash flows, which generates financial bottlenecks for further growth. The decrease in new customers acquisition dampens sales orders backlog, which allows the firm to restore delivery delays. When the market perceives a lower delivery delay, new customers and sales orders start to increase again. However, this gives rise to a new increase in both the backlog and delivery delays.

In order to stabilise experienced oscillations, the company finally undertakes a post-sale assistance policy. However, although this improves both income and bank balances, it does not allow the firm to pursue a sustainable growth as its product scope has become too large, if compared – at least in the short/medium term – to the business service capacity (figures 14 and 15).

The relevance of the SD approach in portraying the above commented acquisition and draining processes affecting strategic assets in e-commerce ventures originates from its support in explaining the 'physical structure' of the relevant system. A structure consisting of several sequentially interconnected levels implies a chain of delays which can generate unpredictable oscillations in strategic assets behaviour, leading to an unmanageable system (Forrester 1961, Sterman 1989).

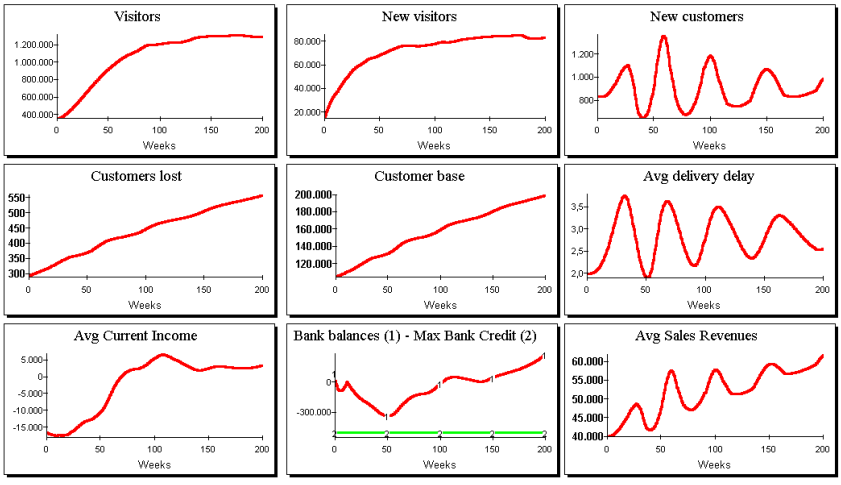

Figure 15: Main key-variables dynamics related to a model base run

In order to effectively manage an e-commerce venture, entrepreneurs must be aware of the feedback structure underlying business processes. They must be also able to selectively act on different policy levers affecting the accumulation and draining processes of strategic assets.

Concluding remarks and implications for further research

This paper has outlined the main findings from a research project on the opportunities and pitfalls related to e-commerce strategies in SMEs.

In order to focus the context of our analysis, main critical success factors of SMEs' e-commerce strategies have been initially discussed, as they emerge from the literature.

Three case-studies portrayed by the literature have been selected and debated in a feedback perspective of SMEs' strategic assets accumulation and depletion processes. Such an analysis allowed us to outline some critical strategic assets (e.g. entrepreneur's available time to handle customer queries, query database, mailing lists), that are peculiar to the e-commerce context, whose dynamics may significantly affect SMEs success or failure.

From the investigation of case-studies also emerged the importance of:

- promptly perceiving weak signals of change
- discerning short vs long-term effects from adopted policies
- detecting reinforcing and balancing loops affecting strategic assets' dynamics.

The main results from a survey conducted by the authors on SMEs pursuing e-commerce strategies have referred to a lack of resources, the importance of quality and customer services, as well as advertising and information systems as powerful levers on which to act. Other important issues that have been noted are managing customer relationships and searching for new contacts in the competitive system.

Both the issues emerging from the case-study analysis and the survey findings supported the authors to build a generic SD simulation model to analyse growth and decline processes in SMEs pursuing e-commerce strategies. The structure of the model and a base run have been analysed in the last section of the paper, in order to show how a simulation tool can support SME entrepreneurs to selectively act on different policy levers and to explore alternative scenarios in e-commerce ventures.

Further developments will imply new contacts with interviewed entrepreneurs, aimed to test the model assumptions and to experiment its likelihood to foster SME entrepreneur's learning in pursuing growth through e-commerce ventures.

Notes

1) By "generic model" we mean those simplified pictures of reality reflecting the broad processes (e.g., financial, production, distribution) of any firm, often related to a given industry (Lane, Smart 1996; Winch et al. 1997).
2) E.g., knowledge, image, financial resources, production capacity.
3) The firm receives on average 10 visitor's queries for each sales order.
4) Many orders are, however, transmitted by clients via fax or phone, as visitors are not confident to give their credit card number through the Internet.
5) Both questionnaires and a detailed survey results have not been here presented, as their analysis goes beyond the purpose of this article. Such materials are available on request from the authors.
6) These findings are supported by other research projects conducted on the field. KITE 1999; The European Observatory for SMEs, Sixth Report, 2000.
7) Such period has been set to capture the short and long term effects that SMEs' e-commerce strategies are likely to generate. From our survey emerged that the novelty of the e-commerce phenomenon for SMEs, its changing complexity and unpredictability make extremely hard any reliable assessment of future events going beyond three-four years.
8) Model's equations are available on request from the authors.
9) This is quite a recurring problem in e-commerce ventures. Both in our survey and in the press on e-commerce failures, bottlenecks caused by a rising product scope have been mentioned as a primary reason for customer dissatisfaction. For instance, in Italy, the failure of Zivago (a company operating in books and CD-ROM e-commerce) was indicated as a main effect of unreliable delivery delays. Marco Patrone, a dissatisfied client, accused the company not to be well organised in honouring promised delivery delays. He said: "I bought four times from Zivago: the first time everything was OK, but it was the 17th February 2000, the second time (17th June 2000) there have been some delivery problems (some books were missing), the third and fourth time (26th October 2000 and 7th November 2000) I was very angry as I didn't receive any feedback from the company even after 10 days from the expected delivery time. When I sent several e-mails to protest and ask to receive immediately the goods, I was initially told that the problem was related to suppliers and other silly reasons. After I seriously got irritated, I received all the goods. However, I promised myself not to buy anymore from this company". (Source: Zivago, la lenta strada dell'e-commerce, [Zivago, the slow path to e-commerce], in http://www.cww.it/ecommerce/2000/11/27133618.htm).

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