
Unleashing growth potential in 'stunted' SMEs: insights from simulator experiments

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Abstract: The literature recognises the phenomenon of 'dwarf' or 'stunted' small and micro firms (in Italian *nanismo aziendale*) and that they might represent potential lost opportunities for owners and the local economy. This paper describes the development of a simple 'insight' model to simulate the behaviour of such firms. The model replicates the basic no-growth, cyclical behaviour attributed to them and shows how changes in targets and attitudes towards asset management can change that behaviour to one of stable growth. In this simple form, the model does link behaviours to system structure and could support individual entrepreneurs in understanding the reasons for dwarfism in their firm and the potential for unleashing their growth potential. It could further form the basis for a more detailed model that could support the identification and evaluation of strategic alternatives in individual firms.

Keywords: stunted-growth; dwarf businesses; nanismo aziendale; growth; strategy; simulation.

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1 Introduction

An identified phenomenon in the study of small businesses and entrepreneurship is the 'stunted-growth' enterprise or 'dwarf business' situation. This applies to small companies that cannot be judged as unsuccessful as they have survived for many years and may well have provided their owners with a satisfactory lifestyle, but despite having the potential to grow into larger companies they have remained very small. Some of the reasons for this have been examined in Bianchi *et al.* (2004), and include the level of entrepreneur's inclination to change the business *status quo* and the consistency of strategic business assets.

Companies that under-perform in this way fail to improve the earning possibilities for their owners and do not offer the wealth generation and employment opportunities for their local communities. Given the recognised importance of small firms in local economies and the failure rates of new firm start-ups and associated difficulties in developing long-term sustainable businesses, this latter disbenefit is an important loss. This paper describes the extension of the original work by Bianchi and his coworkers by the construction of simulation models based on the structures they identified.

The feedback models described here are based on structural diagrams capturing the inter-relationships between drivers and decision processes in and surrounding the small firm. These are based on causal-loop diagrams, system maps that reflect the circular causality that determine system behaviour. The use of simulation models in this way enables theories about the reasons for business dwarfism to be tested by creating models which replicate the behaviour of actual organisations through the generation of 'reference behaviours' – the characteristic shapes of graphs of key variables over time (time paths). Once the possible drivers and decision-making that have lead to dwarfism have been identified, further experiments with the model can investigate possible changes in a stunted business' policies or practices which would offer routes to business growth.

2 The notion of 'stunted' or 'dwarf' businesses

The work that forms the foundation for this extension is reported in Bianchi *et al.* (2004), which includes a detailed review of the literature on *dwarf* or *stunted* firms. A subset only of that literature is reviewed here, focussing on that which relates most directly to the construction of simulation models of possible mechanisms in stunted firms.

The term *business dwarfism* (in Italian *nanismo aziendale*) has been widely adopted in recent times in the Italian political and socio-economic debate, in order to label a stereotype of business marginality and entrepreneurial mediocrity, based on a structural disengagement from growth. Such firms may well be 'successful' in the sense that they

have survived over many years, maybe multiple generations of family ownership and have been profitable or at least have provided the owner entrepreneurs with what they consider an adequate quality of life. Such firms may well have had significant growth potential but the owners have seemingly been unaware or unconcerned that the firms remained small, or 'stunted', and growth potential has not been realised. 'Dwarf' firms are commonly characterised (Russo, 1988) as those small and *micro* businesses whose structure and management routines have been kept unchanged over several decades, in terms of structure (*e.g.*, product portfolio, strategic product positioning, organisation, number of employees, production capacity, geographical markets), processes and relational systems. An implicit assumption of this perspective is that those smaller firms which have not been increasing their size for a long time – in terms of quantitative indicators – are affected by a 'structural disease' and support systems and tax incentives have been proposed to remedy this malaise (for example, Rapporto ISAE – 4th Report, 2003). This may support owner-entrepreneurs whose firms are stunted despite their efforts and intensions, but does not address the circumstances of those whose 'disease' is purposefully chosen.

Holmes and Zimmer (1994) distinguish *Growth Capped* from *Growth* SMEs. In the first kind of firms, growth is sought and plans are developed to facilitate it. However, growth will only be financed by additional equity inputs of the existing owners or trading bank debt. Provided that new equity from outside sources is not an option, such firms have internal limits to growth. Conversely, the latter kind of firms is more prone to accept external capital sources to foster growth, which allows them to reach a larger size and foster change. Further, Gibson (2002) asserts that "the notion that firms may have a capped growth objective is evident in many areas". This work believes that there are thus many *micro* and small firms, where owner-entrepreneurs take actions that indicate they are concerned with maintaining a stable business and that growing out of this stability is not regarded by them as a primary objective.

In empirical research oriented to understand growth and non-growth motivations for an entrepreneur, Perren (1997) defined a number of relevant factors, such as:

- owner's growth motivation
- management expertise for growth
- resource access
- demand for products or services.

This author found that non-growth firms shared a common set of negative motivations towards growth amongst their owners, and that these effects are particularly significant when the market shows a rising pattern of demand for the business products. Similarly, Brown and Kirchoff (1997) have investigated the effects of resource availability on entrepreneurial orientation, and they distinguished two important factors: *perceived environmental munificence* and *resource acquisition self-efficacy*.

3 The role of simulation modelling in SME learning and policy formulation

Bianchi *et al.* (2004) posited a set of possible dwarf business structures based on feedback thinking and structural diagrams reflecting a resource-based view of the firm (see, for example, Amit and Schoemaker, 1993; Dierickx and Cool, 1989; Warren, 2002). In this paper, we describe the development of a quantitative model based around the resource structures identified in Bianchi *et al.* The model is intended to enable light to be shed on the way that managerial behaviour as captured in the model, including reflections of attitudes and motivations towards growth achievement or otherwise impact on company performance. Simulated small firm behaviour could make those entrepreneurs, unaware of the possibility of these factors stunting growth, appreciate this condition, or, in the case of those already aware of missed growth potential opportunities, they could reinforce the specific factors in play. The model could then further be used to investigate alternate, growth-based, behaviours that could point to changed and improved decision-making.

The use of this form of modelling to support learning and understanding of SME behaviour and to support entrepreneurs in decision-making and policy formulation is well established by the current authors as discussed below and by others (see, for example, the Special issue of the System Dynamics Review, on Small Medium Enterprises, Bianchi, 2002).

Bianchi and Winch (1999) have reviewed the extent to which such approaches have particular relevance to the SME and have also considered the specific role of simulators to link strategic thinking with formal business plans (Bianchi *et al.*, 1998). Simulators can prove particularly valuable in situations of major change, such as would be the case if a small firm were to break out of their capped or stunted growth mode and to move to a growth mode. Winch and McDonald (1999) and Winch (2000) have reported the potential for such SME simulators in aiding learning and change management in SME situations.

A major issue arises, however, in terms of the level of detail and accuracy necessary in such models, particularly given that the construction of detailed models closely reflecting any actual firm is an expensive process, typically outwith the cost scope of the smaller enterprise. That said, the notion of using very simple models for first analysis even in high-cost consulting applications is already recognised and the term 'insight model' has been applied (Lyneis, 1999). Further, it is argued (Arthur and Winch, 1999) that if the real test of a model's validity is based on its 'usefulness' to users – how effective they found it in improving their understanding and stimulating their thinking – rather than on how closely it mimicked reality of historic time series, then relatively simple models might be valid, and just as effective as highly detailed models. If simple models can be useful and, particularly, if they could be tailored to an individual firm by a simple and inexpensive process, then simulators could be provided to individual firms to support their particular change management issues. The role of user-parameterised generic models has been investigated to serve this end (Winch and Arthur, 2002).

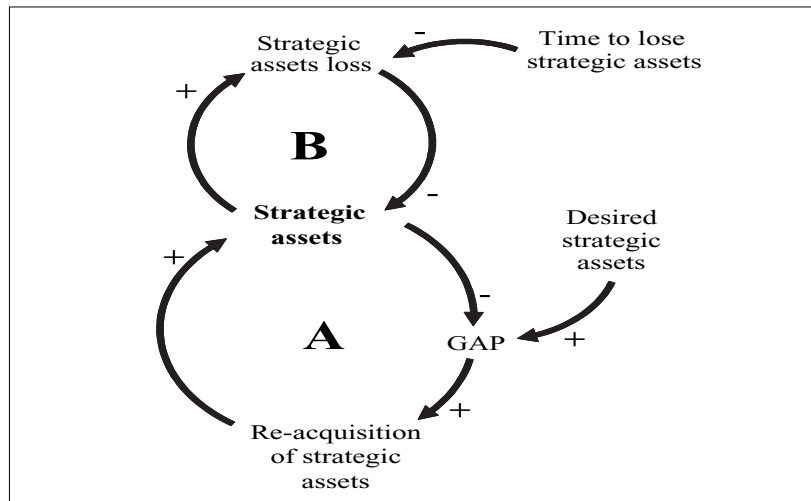
4 Structural basis for the simulation model

The major structure that leads to stunted growth identified by Bianchi and his coworkers concerns the accumulation of a company's strategic assets and specifically the balance between processes that run such assets down and those that build them up (Bianchi *et al.*, 2004). (This basic structure was originally identified by Forrester (1961) as a key to organisational success in his early seminal introduction to system dynamics.) The term *strategic assets* is a catch-all term and includes a range of different assets or resources critical to the success of firms. These could include financial assets, customer base, knowledge, product range, product and/or service quality, but may vary between firms and markets.

Bianchi emphasises the interrelationship between these key forces as in Figure 1.

There are two key loops. Loop B reflects that strategic assets are not immortal and can be lost over time through a variety of processes – plant can deteriorate, customers can be lost, quality relative to competitors falls if they have a better product development programme. Loop A reflects that the firm probably has a target for the strategic assets, hopefully explicit but maybe only loosely in mind, and will take remedial action if the assets fall, or fall significantly, below that target. On its own, loop B will tend to drive assets down to zero, while loop A will attempt to control the assets at or around the target.

Figure 1 Key structure of strategic assets

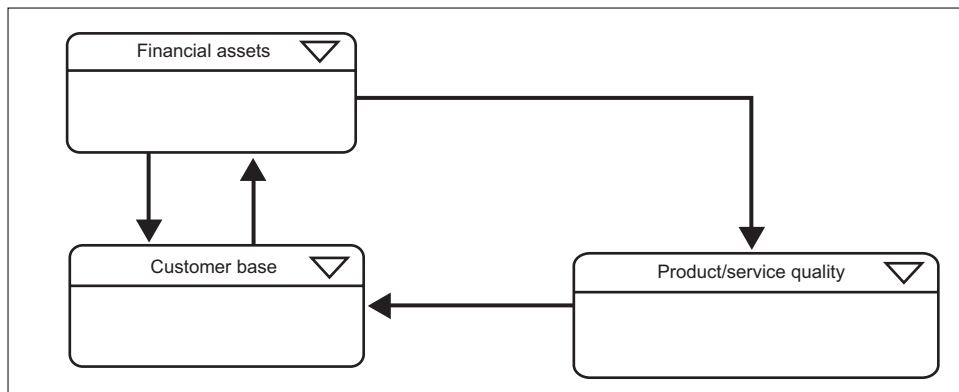


In a firm that is not actively seeking growth and perhaps where the entrepreneur is focused on day-to-day operations, then assets might be expected to fall away over time (Bianchi, 2002). This action could almost be seen as a self-fulfilling mechanism in that the weak asset position is likely to militate against any activities that could lead to growth and could, if uncorrected, lead to a business crisis. Such enterprises most likely do not have a very active programme of replacing lost assets, so the asset loss could go on for a period of time. Of course, dwarf firms are not firms that fail, but ones which survive and possibly operate reasonably profitably over long periods albeit at a small size. It is inevitable, therefore, that at some point, if the dwarf firm owner-entrepreneur recognises

that the asset position has deteriorated, maybe to a point where normal operations are threatened, then remedial action is likely to have been taken. Thus, over a period of time, dominance switches between the two loops in terms of which is most influential on current behaviour and an oscillatory pattern of falling and recovering strategic assets will be observed. This pattern suggests that the firm could survive at modest levels of activity but would find breaking out and moving to growth mode would take purposeful changes in operating policies.

The simulator that has been constructed is designed to reflect a set of critical interacting assets to establish that this kind of oscillatory behaviour can be produced by this double loop structure. The model includes stocks or levels of three important strategic assets – financial assets, the quality of a firm's products or services and the firm's customer base. Each of these assets has an outflow reflecting loss or deterioration of the asset and an inflow reflecting that actions can be taken to build them up. Direct action in terms of product/service R&D and enhancement and more active sales efforts with promotions, and so on, are feasible for the latter two assets, but in the first – the financial assets – the in-flow must depend on actions in the other two, leading to increased sales revenues. In this model, it is assumed that the eyes of the owner would mainly be on the financial assets and it is here that the model assumes targets are set and remedial action is triggered when finances dip to an unacceptable level. The overall structure of the model is summarised in Figure 2.

Figure 2 Three interlinking substructures for key strategic assets

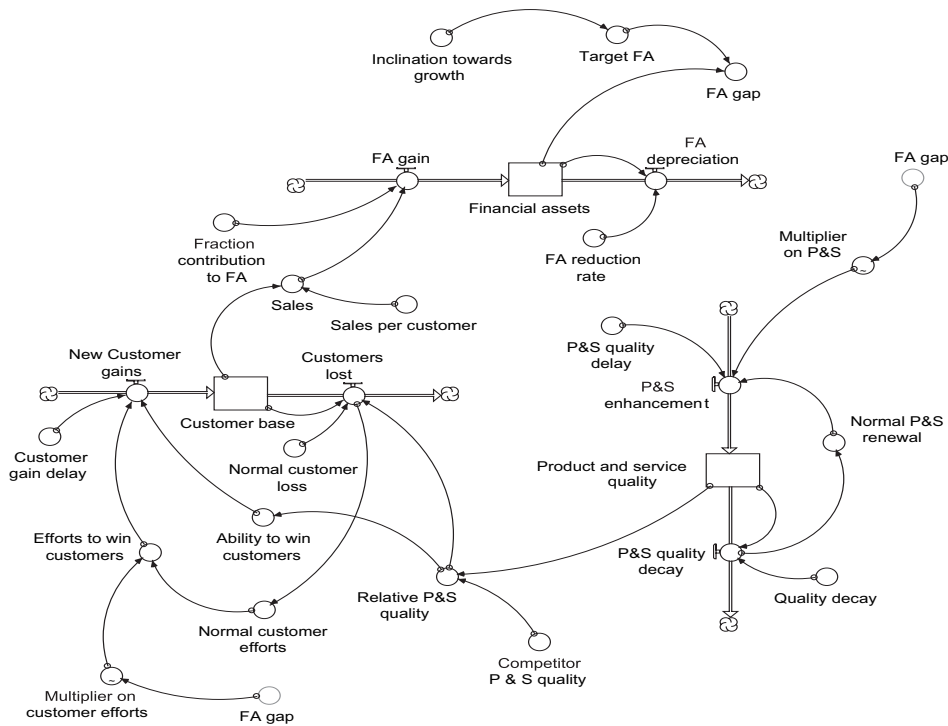


The model, thus, reflects a management process whereby, if it is decided that the financial assets are unacceptably low, the firm will increase activities to enhance product/service quality and will increase its efforts to win new customers to restore assets to the desired level. Further, the link from *Quality* to *Customer Base* also indicates that the model includes a mechanism that makes it easier to win and retain customers if the firm's quality is relatively higher than its competitors. The model is populated with figures that are reflective of a generic organisation, and are not calibrated to any particular firm. The units for financial resources would be in any appropriate currency unit, customer-base in any number of customers. Quality, being an intangible asset (*i.e.*, one that cannot be directly measured), is measured as an index where '1' indicates parity with competitors quality, below suggesting inferior quality and higher suggesting a superior offering.

The decision processes are set up in the model to reflect what is believed about managers in such firms. If the financial assets are above or close to their target, then they will be pretty relaxed and will make no great efforts to match competitors' quality advances or replace lost customers. As the situation deteriorates though, they will become progressively more concerned and increase their actions to recover. The final model is shown in Figure 3.

The diagram, which is exactly equivalent to the formulations in the model, reflects the stock-flow structure inherent in system dynamics analysis and closely allied to the resource-based view of the firm. Thus, the three key assets are reflected as stocks or levels, each with an inflow and outflow represented by pipes with the rates of flow controlled by valves. The stock-flow structures are connected with each other by information links, auxiliary variables and decision processes.

Figure 3 Dwarf business model



5 Simulations with the model

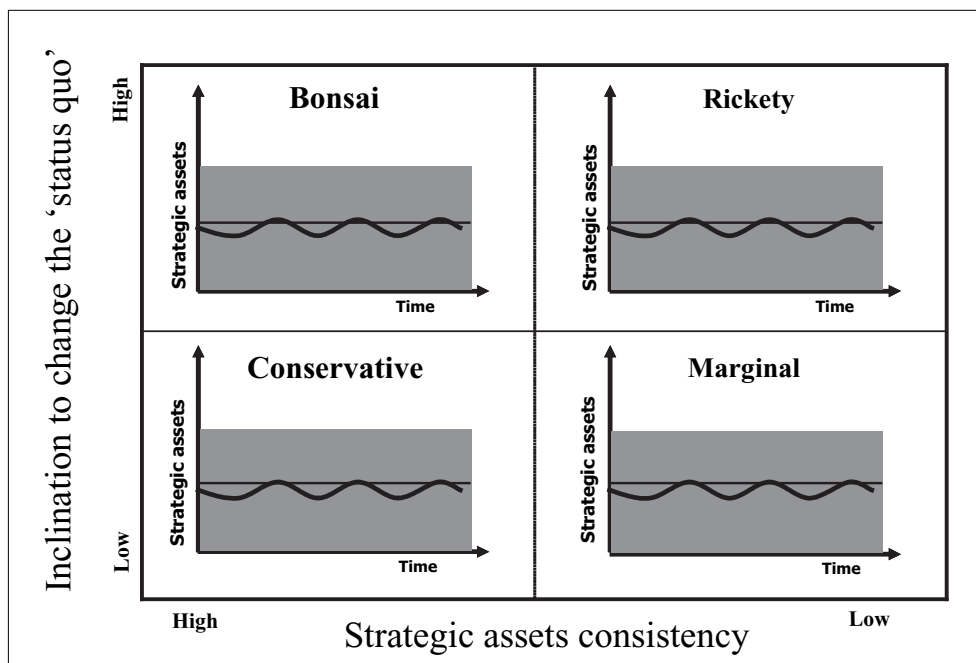
5.1 Base or reference behaviour

A starting point for most system dynamics studies is the identification of a 'reference behaviour', a single variable or set of time-series patterns that characterise a system's basic behaviour. In their original analysis, Bianchi *et al.* (2004) identified four different forms of dwarf business: *Bonsai*, *Rickety*, *Conservative* and *Marginal*. They characterised the four types in these terms:

- 1 *Bonsai* characterises those 'dwarf' firms within which there is an entrepreneurial spirit that is opened to possible future changes in the business *status quo* – which could be kept silent even for a long time, because of a stable relevant context. These firms also show a harmonious profile, implying a balanced and homogeneous setting of different subsystems suggesting that change could be achievable.
- 2 *Rickety* firms, on the other hand, reflect the situation where the entrepreneur's inclination to change the business *status quo* to foster the undertaking of new growth paths is not supported by a consistent set of strategic assets, neither in terms of their level and mix.
- 3 *Conservative* firms do not display an inclination to change and are likely to keep a relatively stable and consolidated equilibrium condition in their current strategic assets profile.
- 4 *Marginal* firms are usually in the market because of their ability to exploit contingent favourable conditions, for example, associated with public financial aids, lack of competition in very tight market niches or a very loyal customer base. In terms of changing environmental conditions, one would expect such firms to be in a particularly weak position.

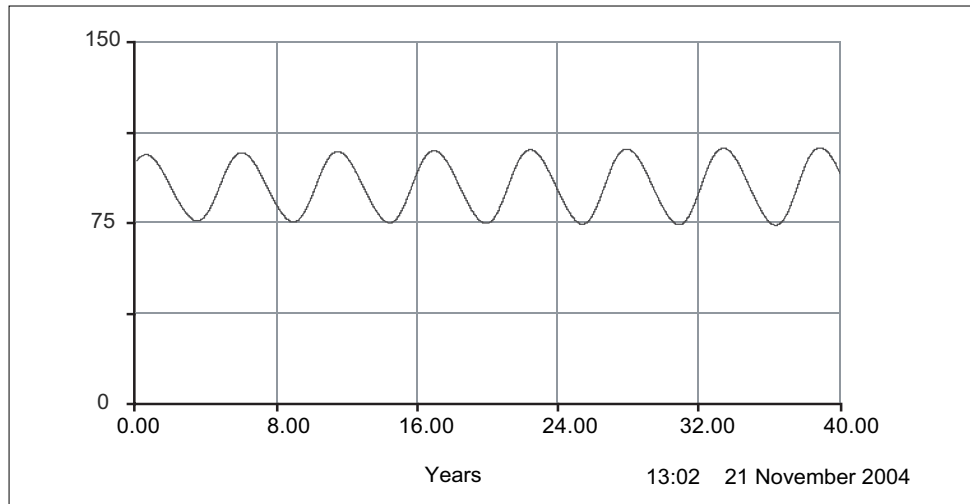
However, for all four groups, they suggest a common reference behaviour – a no-growth situation with fluctuations around and just below what might be considered a company's target for strategic assets. They presented this summary in graphical form, a simplified version of which appears here as Figure 4.

Figure 4 Characterisation of different forms of dwarf or stunted business with common reference behaviour



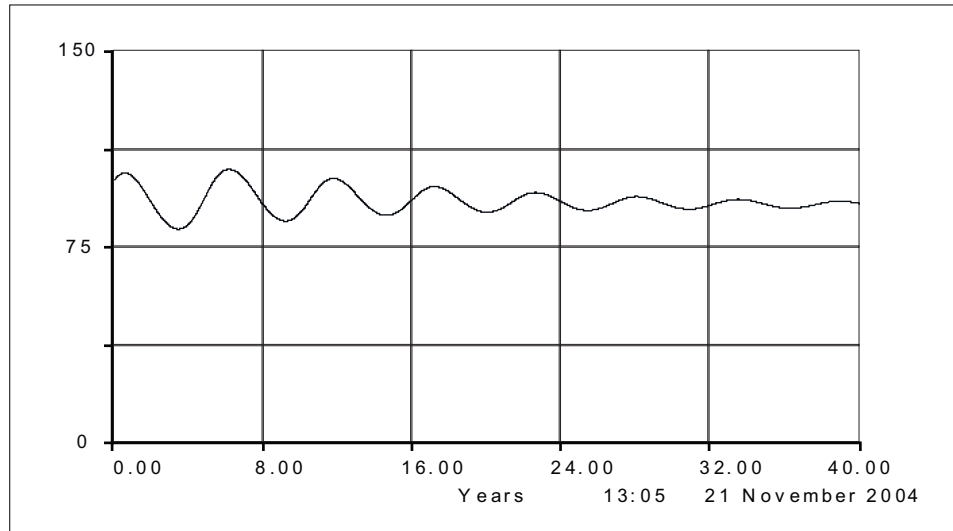
The model described above and parameterised with reasonable values, was simulated over a long period of time, 40 years. This time was chosen simply to reflect that dwarf firms do survive for an extended period of time, and it was also considered long enough to permit oscillatory behaviour to be easily observed. The base run for the models appears as Figure 5.

Figure 5 Reference behaviour of dwarf firm with oscillating strategic assets



As can be seen, the system does indeed oscillate with financial assets, the strategic issue being used here as the central performance metric, oscillating just below the target level set in the model. The periodicity of the cycles (around five years) is a function of the assumed delays and decay rates in this example model, while the amplification is a function of the attitudes and strength of response by the simulated firm when managing product/service development and efforts to win and retain customers. Should the functions that represent these latter factors be changed, then, the amplification changes accordingly. For example, a less relaxed reaction to financial assets being below the target results in smaller oscillations closer to the target figures as in Figure 6.

As can be seen, the less relaxed response actually suggests that the oscillations will die out over time. This might be the case if the operating environment were perfectly constant over the period; however, perturbations like changes in the environment are likely to trigger further oscillations. The model, therefore, demonstrates the basic reference behaviour of the dwarf firm and does respond, as expected, to changes in structure like a more reactive management attitude. Of course, should this model be required for detailed analysis of specific management strategy options, then, it would have to be more closely calibrated to the actual firm and more rigorously validated against historic values and with other tests. However, for the purpose of simply gaining insights into possible strategic moves and their consequences, this model is a useful starting point.

Figure 6 Behaviour of modelled firm with less relaxed responses

5.2 A possible scenario for a stunted firm to break-out into growth mode

The model was run with a variety of scenarios that reflected different possible futures for a dwarf firm to break-out of its stunted growth situation. Two are presented here to indicate the outputs obtained and to consider their implications.

Figure 7 represents a situation where, at year 40, the firm decides to deliberately aim for growth. The growth rate selected is modest, only 2% simple growth per year, but when accumulated, it does lead to significant growth over a further 40 year period and the modest growth is likely to be achievable without any major changes to the firm's organisational structures. As can be seen growth is achieved, but the fluctuations remain. Indeed, the amplitude appears to be increasing (grey line 2). A similar pattern was achieved if a growth rate of 5% per year was applied in the same way.

This scenario still reflects the company having a relaxed attitude towards the financial assets situation, and if the firm decided to go for growth, even at this modest level, it is likely that it would also adopt a more reactive attitude towards asset shortfalls against its growing target. Figure 8, therefore, incorporates such a more reactive attitude, similar to that applied in the modified run shown previously.

Figure 7 Scenario with simple growth of 2% of base assets per year

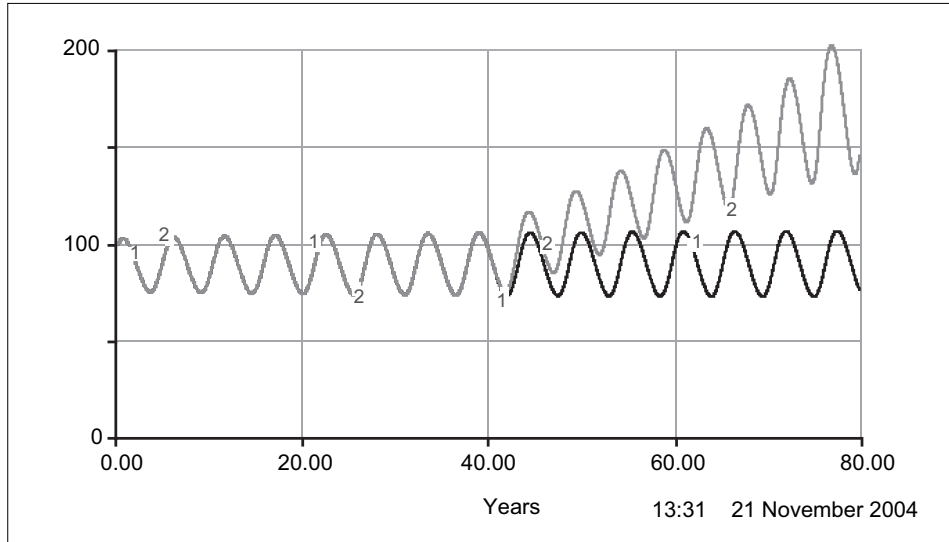
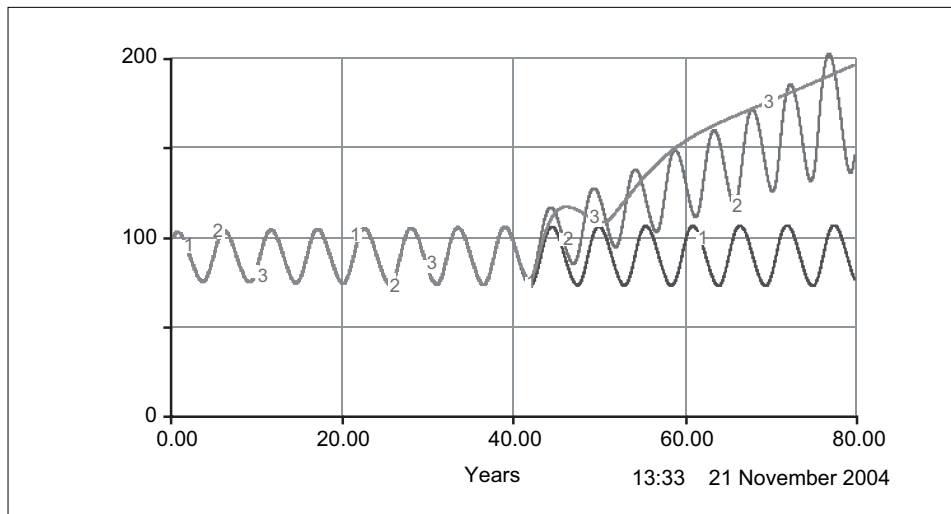


Figure 8 Firm adopts a growth target and a more reactive attitude to control



With this additional change (grey line 3), the company is indeed able to break out of its stunted growth and move into a period of sustained and stable growth. Indeed, it does also appear that the pattern of growth is settled into more quickly and actually advances above the central growth trend in the fluctuating case.

These simulations confirm that the application of simple changes in owner-manager attitudes could potentially enable a stunted firm to break-out into growth, but highlights that the kind of stable asset situation beneficial for sustained growth would also require the move to a more reactive attitude to strategic asset management than is perhaps typical in dwarf businesses. Of course, the simulator is only a simple reflection of the selected

key assets and it can in no way point to specific actions to achieve quality improvement and build the customer base. However, by demonstrating that growth objectives might be feasible, it should stimulate and encourage the owner-manager with perhaps other family stakeholders to take a more detailed look at the practical options.

6 Discussion and conclusion

The literature has identified the dwarf or stunted growth firm, or *nanismo aziendale*, as a significant phenomenon in the small-medium enterprise field. Firms in such circumstances might be failing to maximise the income and wealth creation potential for the owners and mean that the local economy and employment prospects are also constrained. Of course, it is also recognised that in many cases the owners are not unhappy with this situation and the firm, maybe through a number of generations of family ownership, has provided a satisfactory income and lifestyle. However, as the case-studies in Bianchi *et al.* (2004) also pointed out, there may be changing environmental conditions or changes in ownership that demand that a firm moves into a growth mode.

In practical terms therefore, there are potentially three challenges facing the owners of a dwarf firm:

- 1 Enlightening owner-managers that their firms may be in a stunted growth situation and that there could consequently be opportunities for moving the firms forward. (Though, of course, with the rider that individual owners might not wish to embark on that path).
- 2 Assisting owner managers who might wish to break-out in understanding why the constraint has historically occurred, in identifying the possible constraining mechanism(s) and where there is potential to break-out by modifying strategic targets and attitudes.
- 3 Identifying and evaluating specific actions and strategic alternatives for achieving growth in the key strategic assets.

The model described in this paper is directed towards the first two of these roles. The last would require a more detailed model calibrated to a specific firm.

Although only a simple model, it does include sufficient detail to enable it to replicate the expected cyclical behaviour of dwarf firms and to reflect, in a meaningful way to managers, the structures that lead to the ebb and flow of strategic assets and that the firm is constrained from achieving any form of sustained, stable growth. It has also been demonstrated in this paper how it could be used to examine certain changes that might enable a firm to achieve growth in the future. Thus, it is argued, this paper provides the proof-of-concept of using a simulator in the first two roles and, even in its present form, the simulator could be used to alert managers and support agencies to the issues in business dwarfism and how solutions in individual cases might be sought. To be fully functional as an insight model, however, it could benefit from further refinement and a development programme might involve the following elements:

- the addition of further mechanisms to represent the management of other strategic assets that might be relevant for a wider range of firms, for example knowledge-base
- the refining of the linkages between the assets sub-sectors, including verification of formulations with practitioners
- completion of a programme of experiments to examine different constraining factors and how they might be alleviated to enable growth.

Such a generic model could then be used with owner-managers, maybe in a collective situation like a workshop or small business organisation event, initially to raise the issue of whether they are all achieving the growth potential of their firms and then to highlight the constraining factors typically in place and investigate how they might be mitigated. A further role for this simple simulator would be to support the efforts of economic development agencies, small-firm training and advisory organisations and consultants who support SME development. The development of dwarf firms into growth firms could be a critical.

Any entrepreneur wishing to pick up on this and who then wants a more detailed model tailored to his/her own firm's circumstances could be provided with this option. This could be achieved through two paths. The first would be through the commissioning of the development of this simple model into a company model by the addition of mechanisms appropriate to its products/services, distribution channels, target markets, access to incentives and support, and so on, and the parameterisation of the model to their own data. The second, and more economical route, could be through the development of a generic model which could be easily parameterised to an individual firm through an easy-to-use interface. As mentioned earlier, this latter concept, labelled Computer-Aided Visioning (CAV), had been shown feasible and effective in other researches (Winch, 2000; Winch and Arthur 2002).

In summary, these results add to the understanding of this particular dimension of the growth dynamics of small firms. They could assist policymakers and small firm support agencies in identifying strategies for support initiatives and training that will help small business avoid the pitfalls that lead to dwarfism and achieve their growth potential. The present simple simulator could also be used to help small companies understand why they might not be as successful as they might be and in the identification of possible changes that could release them from the constraints, or how to avoid falling into this situation in the first place. The present model also forms the foundation for a more fully developed simulator to be used to identify and evaluate practical strategic alternatives to unleash their growth potential.

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