

IT SCENARIOS FOR SMALL AND MEDIUM-SIZED ENTERPRISES

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J.H.M. Stroeken & W.H.C. Knol

Eindhoven Centre for Innovation Studies (ECIS)
Eindhoven University of Technology
P.O. Box 513, NL-5600 MB Eindhoven, The Netherlands
E-mail: j.h.m.stroeken@tm.tue.nl

ABSTRACT

The rapid economic and technological developments in the globally oriented business world make the strategic use of information technology (IT) essential. Small and medium-sized enterprises (SMEs) are running behind regarding the application of IT and therefore it is necessary to stimulate the diffusion and adoption of this technology within this group. In this paper a so-called IT scenario model is described, with which the awareness of SMEs can be raised concerning the strategic application of IT. To this purpose the model interacts with learning processes at the management level to positively influence the mental models. The model is a combination of scenario planning methods and so-called IT growth-phase models. It consists of an environmental aspect, six phases, and three aspect areas. The model was operationalised via various interviews in the furnishing branch. To test the model it was used as a frame of reference in an IT promotion project aimed at the furnishing branch.

1. INTRODUCTION

Modern society is rapidly developing into a society in which information and knowledge are of primary importance (cf. OECD, 1996). The global economic developments and new technologies make it necessary for companies, groups of companies, regions, countries, and pacts of countries to react adequately and quickly, or to attempt to anticipate changes. The development and application of information technology (IT) plays an especially important role in this, where information technology and supply chain reversal are related to processes like standardisation, differentiation, specialisation, and vertical and horizontal integration (Stroeken, 1999). As small and medium-sized enterprises (SMEs) hold a prominent position in the national economies and the level of application of information technology is relatively lower in SMEs, it is essential to stimulate the diffusion and adoption of information technology in SMEs (cf. OECD, 1993, 1995; Hanna et al., 1995; La Rovere, 1996). Diffusion is 'the process by which an innovation is communicated through certain channels over time among the members of a social system' (Rogers, 1995: 5) and adoption is 'the process through which an individual (or other decision unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision' (Rogers, 1995: 20). One important reason for the low level of application of IT in SMEs is the lack of strategic insight of the entrepreneur (RMK, 1997; Stroeken & Coumans, 1998). Entrepreneurs require insight into the changing product options as a result of the introduction of IT, the alternative market and customer approaches, and desirable forms of co-operation. To stimulate diffusion and adoption of an innovation, the first requirement is to raise the awareness of the entrepreneur (cf. Nooteboom et al., 1992; Bessant & Rush, 1995; Rogers, 1995). This paper focuses on a discussion of the so-called IT scenario model as a means to go through the innovation stage of awareness for a strategic application of IT in SMEs. The stages following this, such as the decision to adopt technology and its implementation, which are also relevant for the innovation trajectory, are not discussed in this paper. The research is explorative and non-longitudinal.

Information technology and SMEs are the points of departure for this paper. The term information technology is a broad term and because of the rapid technological developments in recent decades it has many outdated definitions. Freeman & Soete (1985: 46) define IT at a high aggregation level as 'a new techno-economic paradigm affecting the management and control of production and service systems throughout the economy, based on an inter-connected set of radical innovations in electronic computers, software engineering, control systems, integrated circuits and telecommunications, which have drastically reduced the cost storing, processing, communicating and disseminating information. It comprises a set of firms and industries supplying new equipment and software, but its development and applications are not limited to this specialised information technology sector'. From a more pragmatic and technological perspective IT is related to all technologies used to

collect, store, process, graphically display, and transport data, and therefore encompasses computer equipment, system programs, application programs, and communication facilities. What is characteristic of information technology is that it is a generic technology that can be applied in many ways in diverse environments (OECD, 1995). Thus it is also typified as a collection of empty boxes that can be filled in any desirable way (Preissl, 1995). Within this paper IT is viewed as a technological innovation in cases where it is perceived as relatively new by potential adopters (Rogers, 1995). In addition, a distinction can be made in IT between technological innovation related to products and those related to processes (Abernathy & Utterback, 1978). Here the emphasis is placed on process innovation through IT, as process innovations are essential for the professionalisation of industry in the long run and thus is partly responsible for an improvement in the competitive position of industry compared to foreign industry for example (Barras, 1990).

The focus is on SMEs because compared to large-scale enterprises they have more problems with the dissemination and application of knowledge concerning new technological innovations such as IT (cf. Nooteboom et al., 1992; OECD, 1995; RMK, 1995; La Rovere, 1996; Stroecken & Coumans, 1998). SMEs have different definitions in different countries and institutions. For the purposes of this research SMEs are defined as all companies with less than 100 employees. As regards differences between SMEs and large-scale enterprises, Rothwell & Dodgson (1994) distinguish material advantages and behavioural advantages. The relative strength of the larger enterprises mainly stems from their material advantages, which are related to the economics of scale and scope, the availability of relatively cheap financial means, ways to spread risk, a greater capacity to specialise people and means, etc. (Nooteboom, 1994; Rothwell & Dodgson, 1994). On the other hand, the relative strength of smaller enterprises stems from the behavioural advantages related to matters like higher work motivation of employees, more variation and improvisation in tasks, tacit knowledge about unique skills, more efficient communication, and flexibility resulting in less bureaucratic decision-making procedures and a more co-operative style of management (Nooteboom, 1994; Rothwell & Dodgson, 1994; OECD, 1995). Problems generally characteristic of SMEs are related to a lack of knowledge and lack of time in which to acquire knowledge, a lack of management skills, a fear of growth and an accompanying short-term perspective, a poor external orientation which means that signals from the environment are not recognised until it is too late, a weak financial position resulting in low levels of investment, and a lack of means to school employees in-company (cf. Soh et al., 1992; OECD, 1995; Fuller, 1996; Stroecken & Coumans, 1998).

To stimulate the diffusion and adoption of IT in SMEs, we must first make enterprises aware of the strategic role of IT. The IT scenario model is an instrument for this. Theoretical approaches and concepts concerning learning processes, scenarios, and IT growth-phase models in particular are the foundation of the IT scenario model and will be discussed below. Next, the creation and branch-specific operationalisation of the model is considered, after which a short test is described. The paper is rounded off with conclusions and recommendations.

2. LEARNING

The theoretical concepts and approaches regarding cognitive processes of learning and knowledge offer insights that allow us to influence the strategic application of IT in SMEs. In the first instance the adoption phases knowledge and persuasion are of importance here (cf. Nooteboom et al., 1992; Rogers, 1995) and with that awareness in connection with uncertainty and receptiveness are also of importance. According to Rogers (1995) uncertainty implies a lack of predictability, structure, and information. In the adoption process of a complex, technological innovation, such as IT, the aspects of uncertainty and awareness are not related to innovation but also to the context of the innovation (Tornatzky & Fleischer, 1990). The bounded rationality of the individual places restrictions on rounded arguments in the adoption process (Simon, 1955, 1959, 1990). In relation to this bounded rationality, Polanyi (1962, 1966, 1969) indicates that a large part of our knowledge is situated in the subsidiary awareness and that a rational consideration therefore is mainly based on part of that knowledge which is temporarily stored in the focal awareness. Thus, according to Polanyi a major part of human knowledge is tacit and that is why it is difficult if not impossible to make this tacit knowledge explicit or to move it to focused awareness. Nooteboom et al. (1992) list two reasons why knowledge in small enterprises is more tacit than in large enterprises. In the first place the internal and external communication generally is informal and oral and secondly the formal and abstract knowledge of entrepreneurs in SMEs generally is limited. Tacit knowledge is obtained through learning by doing (cf. Polanyi, 1962, 1966, 1969; Nonaka, 1991). In this way insights in the field of cognitive processes offer a clearer view of the diffusion and adoption process of complex technological innovations (Attewell, 1992; Nooteboom et al., 1992; Howell, 1994).

Learning processes can be described at the individual and organisational level. Individual learning about a specific technology according to Attewell (1992: 6) is related to 'the distillation of an individual's experience

regarding a technology into understandings that may be viewed as personal skills and knowledge'. To compensate for the limited process capacity concerning the knowledge of complex choices, individuals store experiences in cognitive structures from a cognitive psychological perspective; these are also referred to as mental models. These models are personal descriptions of situations formulated in abstract terms as opposed to concrete descriptions of specific situations (Johnson-Laird, 1983) and are shaped by the social and cultural backgrounds, experience, and education of the person in question. Other terms for these cognitive structures are *schemata* (Neisser, 1976), *scripts* (Abelson, 1976; Schank & Abelson, 1977) and *causal maps* (Weick, 1979). Individuals learn when they change their perception after researching and evaluating the results of their actions. The learning cycle of Kolb (1976, 1995) provides more insight into the nature of these learning processes (figure 1). This cycle has two dimensions, i.e. a dimension consisting of concrete versus abstract notions and a dimension consisting of active versus relative notions, in which Kolb (1976, 1995) distinguishes four steps: concrete experience, observation and reflection, formation of abstract mental models, and the testing of implications of theories in new situations. Together these steps form a learning cycle. By going through these steps implicitly or explicitly, individuals gain insight and knowledge regarding known situations and incidences and situations they are yet to be confronted with. The degree to which a learning cycle can be gone through therefore touches upon the degree of innovativeness of a person. The latter strongly depends on aspects like background, education, social status, etc. (Rogers, 1995) and thus are partially conditional for going through the various learning cycles.

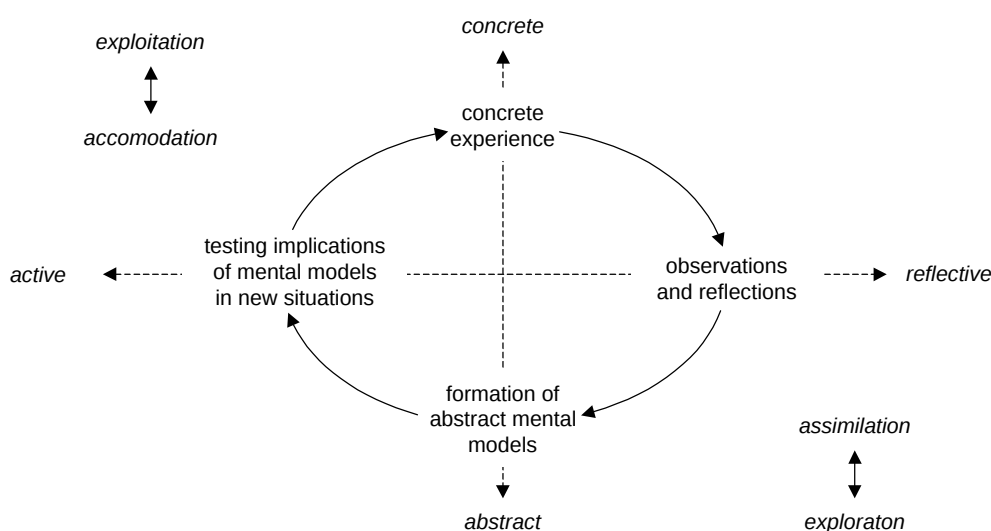


Figure 1: The learning cycle of Kolb (1976, 1995)

The learning cycle of Kolb (1976, 1995) can be related to the theoretical approaches of Piaget (1936, 1937; Flavell, 1968) regarding the aspects of assimilation and accommodation (Nooteboom, 1997, 1998; Bood & Postma, 1998). According to Piaget, assimilation is the process in which individuals force their mental models on the environment (world) in which they live; the process of accommodation is the exact opposite, in which individuals adapt their mental models to their environment. Bood & Postma (1998) reason that two steps from the learning process of Kolb, i.e. active implementation and concrete experiences stimulate accommodation, and that the steps reflective observations and abstract conceptualisations stimulate assimilation. To optimise the learning process accommodation and assimilation must be in equilibrium (Bood & Postma, 1998).

The adoption and implementation of a complex new technology requires learning at an individual and organisational level according to Attewell (1992). The concepts sketched at the individual level can be compared to the approach of March (1991) regarding the aspects of *exploration* and *exploitation*. Exploration is related to matters like searching, discovering, variation, flexibility, risk taking, experimenting, and innovation, while exploitation encompasses matters like selection, implementation, efficiency, refinement, production and execution. In March's view (1991) both aspects are required in an enterprise for it to survive and flourish. Exploitation generally leads to a higher degree of certainty in the short term, because the implications of exploitation become visible more clearly and more rapidly. Exploration is more focused on the long term and encompasses a lot of uncertainty due to unpredictable developments on the market, relations, technologies, etc. Change processes within an enterprise are more likely to focus on exploitation than on exploration. This leads to risky situations because the mental models of the individual members of the enterprise tend to converge towards routines (Nelson & Winter, 1982) related to the phenomenon of exploitation, which means that the knowledge

that the members possess no longer is homogeneous. This way a link can be made between the individual and organisational level. The dominance of exploitation over exploration in an organisation leads to the dominance of assimilation over accommodation and vice versa (Bood & Postma, 1998). An explorative attitude calls people to focus on renewal and innovation, but forms of exploitation should not abruptly be abandoned for exploration if there are not motives of opportunities (Nooteboom, 1998). Furthermore it is of importance in the long run that exploitation and exploration are balanced again at the organisational level (March, 1991; Nooteboom, 1998). The above is also closely related to the information processing characteristics, the so-called *absorption capacity*, of the enterprise. Cohen & Levinthal (1990: 128) describe absorption capacity as 'the ability of a firm to recognise the value of new, external information, assimilate it, and apply it to commercial ends'. This capacity strongly depends on the firm's level of prior related knowledge.

Nooteboom (1998) indicates there may be a general logic of learning that is mirrored on the individual, organisational, and sectorial level. As a result Nooteboom analyses the phenomena of innovation, learning and organisation from a broader perspective, in which he takes an integrated approach to evolutionary economics, the transaction-costs approach, the resource/competence view of the firm and cognitive psychology. A coherent development or learning model is drawn from this, which consists of the following stages: consolidation, generalisation, assimilation, differentiation, reciprocity and accommodation (Nooteboom, 1997, 1998). In comparison with the concepts of Kolb (1976, 1995) and March (1991), Nooteboom concretises his learning model by making use of *scripts* to indicate which changes occur in each stage or should occur as regards learned insights and actions. Thus the model provides more insight into the way in which individuals, organisations or enterprises and even sectors develop by following a path of exploration and exploitation, resulting in learning and innovation. Nooteboom (1998) does however indicate that the learning model has yet to be empirically verified.

The concepts of Kolb (1976, 1995), March (1991) and Nooteboom (1998) form a plausible basis to fathom the process of awareness, learning and strategic innovation. The concepts provide insight into the diffusion and adoption mechanisms concerning innovations in SMEs. In other words, the adoption of IT is a form of exploration under the condition that economic opportunities and motives present themselves in the environment. This can be initiated if the members of the enterprise are more able to focus on accommodation than assimilation. Returning to the learning model of Kolb (1976, 1995) this means the members (e.g. the managers and entrepreneur) must come into contact with the strategic implications of the innovation through experience and testing to raise their awareness of an innovation. At the management level this works as follows: the learning cycle starts with the acquisition of concrete experiences in the field that provide individuals specific insights that are retained in the shape of mental models. On the basis of these insights the manager or entrepreneur will implicitly or explicitly formulate policy and undertake strategic action at a strategic level. The implications of these strategic actions will become visible in the long run, after which the manager links these new experiences to his mental models, i.e. testing. Nevertheless Bood & Postma (1998) note that the cycle has three shortcomings at the strategic level. In the first place, individuals possess a certain degree of *cognitive inertia* so that they are not immediately inclined to allow new experiences to have an impact on their mental models. This was indicated in the above with the differences between assimilation and accommodation. In the second place, the length of the *time span* of the cyclical management process prevents us from relating and testing experiences, activities, and implications concerning a particular strategic aspect, e.g. innovation, during the course of time (loss of overview and insight). As a result this delayed feedback makes a smaller contribution to the process of organisational learning. Finally, the degree to which *variations* are present in the mental models of the various managers involved at the group level can lead to problems in determining the strategic policy. This is related to a view to the balance between exploration and exploitation. The three shortcomings mentioned can be resolved by using scenarios according to Van der Heijden (1996) and Bood & Postma (1998) among others.

3. SCENARIOS

The first application of the term scenario in an economic and managerial context comes from Kahn & Wiener (1967). During the oil crisis in the seventies, enterprises like Shell, General Electric, and Lockheed the application of scenarios was extensively researched to provide higher management insight into possible global and sectorial developments. It should be noted that scenarios are not the same as traditional forecastings. Forecastings attempt to exclude any uncertainty by using the *predict-and-control* principle to give exact answers to standard questions. Making scenarios however gives rise to crucial questions like *what if* ? Scenarios leave room for environmental uncertainties by presenting various fundamental future perspectives in a qualitative way. This does not or hardly ever occurs in forecastings. As regards the application of scenarios in recent decades, Bood & Postma (1998) distinguish two generations. The first generation of scenarios is mainly a tool for the

evaluation and identification of future opportunities for organisations. The second generation of scenarios makes managers aware of environmental uncertainties, broaden the mental models of the managers, and activate and speed up the processes of organisational learning (table 1).

Table 1: Two generations of scenarios (Bood & Postma, 1998)

Original functions of the first generation scenarios	
•	Evaluation and selection of strategies
•	Integration of various kinds of future-oriented data
•	Exploration of the future and identification of future possibilities
The second generation scenarios: more recently added functions	
•	Making managers aware of environmental uncertainties
•	Stretching of managers' mental models
•	Triggering and accelerating processes of organisational learning

Scenarios are a tool in the process of strategic thinking of managers or entrepreneurs (cf. Millet, 1988; Van der Heijden, 1996; Bood & Postma, 1998; Gausemeier et al., 1998) and reduce the three shortcomings of the learning cycle at the strategic level to this purpose. The *time span* between experience, activity and implications is reduced by simulating and communicating specific uncertain situations that can occur in reality in a brief period of time. In this way scenarios stretch the mental models of the people involved, so that the degree of *cognitive inertia* is reduced. Moreover, scenarios stimulate creativity and are a way to promote the internal communication of ideas, so that the *variations in mental models* of the people involved can become more balanced. This provides collective insight into the opportunities and threats that accompany particular uncertainties. All this makes it possible for scenarios to develop, simulate and execute strategies in order to offer support to the strategic learning process in the enterprise.

The creation and construction of scenarios is a practical matter and many methods are listed in the literature, e.g. in Porter (1985), Mercer (1995), Van der Heijden (1996), Schwartz (1996), and Gausemeier et al. (1998). Mostly scenarios are not constructed according to a standardised process and there are various differences between the scenario methods. It should be noted that the basic structure often is the same however. The development process of scenarios often involves an iterative process, in which managers or entrepreneurs should be involved during the entire process (Mercer, 1995; Bood & Postma, 1998). Table 2 gives the scenario method of Schwartz (1996) as an example.

Table 2: Scenario method of Schwartz (1996)

Step	Description
1	Problem identification
2	Description of current situation and relevant factors
3	Classification, valuation and selection of scenario-elements
4	Construction of scenarios
5	Analysis, interpretation and selection of scenarios
6	Supporting strategic decision-making with scenarios

The first step in the Schwartz method (1996) involves defining the focus regarding the scenario planning process and usually this means the scenarios are related to the *business* of an enterprise. With this the process of scenario planning already starts out with a focus on the positive influencing of the strategy of an enterprise (Mercer, 1995). In step two the present situation is described, in which various relevant factors are identified by means of a SWOT analysis for example. Relevant factors are related to the most crucial and most relevant developments in society, the sector or branch for the scenario and in the literature they are referred to as *causal factors* (Porter, 1985), *driving forces* (Schwartz, 1996) or simply *drivers* (Mercer, 1995). The third step is related to the classification, weighing and selection of drivers and these can be classified as constant, predetermined, or uncertain elements (Porter, 1985):

- *Constant elements* are elements that will not change in all likelihood.
- *Predetermined structure elements* are the areas where the structure will change, but where the change is largely predictable. Examples are the coming of the Euro or the developments regarding the introduction of a uniform tax system at a European level.
- *Uncertain structure elements* are the aspects of the future structure that depend on unsolvable uncertainties (customer demands, partnerships, and market developments).

An artificial variation in the important uncertain structure elements determines the various scenarios in this step, in which the constant and predetermined elements in each scenario seem unchanged. Step four goes on to construct and work out scenarios, after which they can be applied in the strategic management process of an organisation. This happens in steps five and six.

Scenarios have a reputation of being complex and costly, but Mercer (1995) indicates that scenarios can also be simple. The simpler a scenario and the simpler the process to construct scenarios, the stronger the scenarios are at broadening the mental models of the people involved regarding their content and time horizon. Scenarios have to be comprehensible, feasible, and internally consistent. It is essential to find a balance between the degree to which the horizon is broadened and the degree of credibility of the scenario. Mercer (1995) notes that convincing managers to use the constructed scenarios is the hardest part of the scenario planning process and he speaks of selling the scenarios to the organisation. Usually scenarios and scenario planning is related to the management process in large enterprises, but Bood & Postma (1998) state that scenarios can also be significant in the strategic process of SMEs. Considering the use of scenarios in SMEs is first related to the expansion of the mental models and the raising of awareness concerning strategic changes, it is more attractive to offer a standard scenario for the knowledge and insight level of SMEs instead of going through the entire scenario process. In this paper we assume that the philosophy and methods surrounding scenario planning are also application to promote insights of SMEs concerning the strategic application of technological innovations. In other words, the scenarios can also be applied to influence the learning process regarding adoption, absorption, and the application of strategically valuable innovations. Managers and entrepreneurs can obtain more insight into the possible environmental developments via scenarios in connection with the strategic role of IT. Dierckx & Stroecken (1999) worked out a first example for the car disassembly sector. We want to take things a step further through the development of an IT scenario model. In this it is of importance to take a closer look at the relation between the enterprise, strategy, and IT from a managerial evolutionary perspective.

4. IT GROWTH-PHASE MODELS

The so-called IT growth-phase models make the evolutionary developments of the strategic use of IT in an enterprise transparent. The present models of Venkatraman (1991), Tan (1995) and Stroecken & Coumans (1998) originate from the concepts of Churchill et al. (1969), Nolan (1973, 1977, 1979) and McFarlan et al. (1983) among others. The IT growth-phase models are often composed of different stages, which are also referred to as phases or levels. From an innovation perspective, continuous follow-up adoptions of an ever-increasing level, or advanced or refined forms of technological innovations take place during the course of time.

The first versions of the IT growth-phase model of Nolan (1973) are mainly focused on a descriptive approach of the relative computing costs of an organisation in the course of time. Graphically these cumulative costs form a sigmoidal (S-shaped) curve. In the later versions the model (Nolan, 1977, 1979), consisting of six phases (table 3), has a more normative and prescriptive nature, so that statements can be made about the direction an organisation must take concerning computerisation. Nolan's model was often applied in consultation to determine the phase an organisation was in concerning computerisation, to then make proposals for desirable future developments.

Table 3: Phase model of Nolan (1979)

<i>Phase</i>	<i>Description</i>
1	Initiation
2	Contagion
3	Control
4	Integration
5	Data administration
6	Maturity

Some critical notes can be made about the growth-phase model of Nolan, in which some points of criticism also apply to the models and concepts to be discussed below. The IT growth-phase model of Nolan is mainly oriented towards larger organisation and limits itself in computer applications to administrative application and applications meant to support management tasks in the organisation (Earl, 1989; Saarinen, 1989). By contrast, computerisation applications have been more and more strategic and thus external since the early nineties. Market, branch, and supply chain developments make it necessary for enterprises to strategically implement IT, such as Internet and complex data warehouses, to realise principles like one-to-one marketing for example (Peppers & Rogers, 1997). The model of Nolan describes only one growth trajectory, while there are many different types of organisations in various branches of industry. If we look at the organisational characteristics, for example, we see that SMEs are an extremely heterogeneous group (cf. Nooteboom et al., 1992). Up until the early nineties the model was not tested on SMEs. Cragg & King (1993) doubt whether one phase model could be applicable to all types of SMEs. In addition, from a methodological viewpoint, there is criticism about the limitations to testing and validating the model empirically (Benbasat et al., 1984; King & Kraemer, 1984; Boonstra & Van Dissel, 1992). Despite the points of criticism to Nolan's model, Saarinen (1989) considers it to be a general framework for the analysis of the evolution of IT use in an organisation. Through its simplicity, the

model forms a powerful means of communication between managers or entrepreneurs and experts. Considering the relatively low knowledge level in SMEs, the presence of only one perspective for the future can be viewed as a positive point. Choosing a computerisation trajectory is made far simpler for the entrepreneur.

The *IT-induced reconfiguration model* of Venkatraman (1991), another growth-phase model, provides insight into the evolutionary role of IT in an enterprise from a clearly strategic perspective. It consists of five levels (table 4). Venkatraman emphasises that level one always goes over to level two, but that from level three onwards the levels do not have to follow each other sequentially, i.e. follow an evolutionary path. The strategic focus of Venkatraman's model fits good to the meso-economic oriented developments and Stroeken (1999) gives a recent description of the role of the model in relation to phenomena like supply chain reversal and company network formation. However, it is not clear how intensively the model has been tested empirically. Moreover, the descriptions of the various phases are strongly oriented towards situations relevant to larger enterprises. This does not alter the fact that the concept can be tailored to an individual SME or to a cluster of SMEs at branch level.

Table 4: Reconfiguration model of Venkatraman (1991)

Level	Description
1	Localised exploitation
2	Internal integration
3	Business process redesign
4	Business network redesign
5	Business scope redefinition

It is necessary to give more details concerning the models described, because the adoption and acceptance of IT in SMEs has to be analysed from a broader perspective (cf. Saarinen, 1989; Kelly & Brooks, 1991; Cragg & Zinatelli, 1995; Igarria et al., 1997). In connection with this Tan (1995), and Stroeken & Coumans (1998) provide greater depth to the two IT growth-phase models mentioned above for the adoption and implementation characteristics of IT in larger and smaller to medium-sized organisations respectively. These extra dimensions can be derived from the *consistency model* of Scott Morton (1991) and the *strategic alignment model* of Venkatraman (1991). Both concepts describe various dimensions and aspects related to the strategic embedding of IT in an enterprise and are very similar to the ideas and concepts from innovation literature as described in Tornatzky and Fleischer (1990). The *consistency model* of Scott Morton (1991) contains five complementary basic aspects (strategy, technology, structure, individuals, and management), which all are continuously subject to or initiate change. Besides that, the framework contains two external aspects: the socio-economic and technological environment. The *strategic alignment model* of Venkatraman (1991) consists of two typical domains, i.e. a business domain and an information technology domain, in which the following four interacting perspectives meet: business strategy, infrastructure and processes of the organisation, IT strategy, and infrastructure and processes of the information systems. From both concepts we can deduce that it is essential to unite or even integrate business aspects with IT aspects at the strategic level. One example is the bookstore that embraced the Internet as a direct channel for sales (e.g. www.amazon.com); thus using IT innovatively to provide the individual customer with added value in the shape of information and advice. The concepts give insight into the power elements and their relations from a non-evolutionary perspective and how they influence the strategical embedding of IT in an organisation.

The IT growth-phase model of Tan (1995) (table 5) encompasses five levels and the following seven aspects per level: information strategy, information systems, technical infrastructure, organisation of the provision of information, users, computer specialists, and information management. It turns out that the level model of Tan is focused on a component aspect within larger organisations, i.e. matters related to computerisation. From the perspective of companies or SMEs this level model may be too one-sided, since all sorts of market and supply chain developments are hardly mentioned or not at all. Tan does indicate that the model can also be operationalised in situations of collaborating organisations or coalitions. Tan does not mention empirical verification of the model.

Table 5: Level model of Tan (1995)

Level	Description
1	Functional integration
2	Cross-functional integration
3	Process integration
4	Business process redesign
5	Business scope redefinition

Stroeken & Coumans (1998) developed an IT growth-phase model specifically for SMEs. They distinguish four aspect areas (i.e. IT strategy, technical infrastructure, IT organisation, and IT branch management) and use the five development phases of Tan (1995). The model's main function is to provide an inventory of the computerisation

of the four aspect areas at the branch level. It was empirically tested in three Dutch branches of industry with a large number of SMEs, i.e. the automobile industry, the machine building sector, and the textile industry (Stroeken & Coumans, 1998). The test proved to be very informative for the participating companies and the branch organisations. This implies that the application of the model in practice can raise the awareness of entrepreneurs in SMEs about IT, so that in the long run the diffusion and adoption of strategically applied IT will be stimulated.

5. FROM THEORY TO MODEL

Diffusion and adoption of an innovation such as IT proves to be an essential yet extremely complex process, in which cognitive processes concerning knowledge and learning have an important place. Knowledge strongly depends on the degree of the bounded reality present, is predominantly tacit, and is obtained through learning by doing. Learning encompasses various stages that together shape the mental model of an individual or an organisation. On the basis of this a mental model contains the insights and knowledge to cope with new situations that need to be anticipated or reacted to pro-actively. At the strategic level, three shortcomings could be noted regarding the learning processes, i.e. the presence of cognitive inertia, problems linking the learning stages due to the size of the time span of the learning cycle, and overview problems due to the presence of variations of mental models of the people involved. Scenarios reduce these imperfections and are an instrument to support and influence the strategic management process. Two matters must be noted regarding the application of scenarios in relation to the central points of departure in this paper, i.e. IT and SMEs. First, scenarios are usually oriented towards larger enterprises, because as industry leaders and thus their size related to knowledge, capital, and labour, they cannot afford not to concentrate on uncertain, crucial developments in and around the sector in which they operate. By contrast, the individual SME can be referred to as a follower due to its limited economic size, which means it is less interesting for these companies to enter into a full scenario-planning trajectory. The laborious and complex method of a thorough scenario planning and a lack of knowledge and attention make it necessary for scenarios in SMEs to be oriented towards the influencing of awareness by means of a standard scenario and not so much via a process of development and creation. Second, the focus of the regular scenario methods does not lie in applications for IT in relation to environmental developments. To this purpose the IT growth-phase models provide insight into the way an enterprise should implement IT, in which aspects of branch and supply chain developments should be taken into account. The IT growth-phase models described mainly signal the computerisation level of an enterprise or branch. This research focuses on stimulating the diffusion and adoption of IT in SMEs, so that it is desirable for the IT scenario model to be implemented more pro-actively in a particular branch to raise the awareness of the entrepreneurs concerning the strategic application of IT. By means of an amalgamation of scenarios and IT growth-phase models, the IT scenario model is an instrument for influencing learning processes regarding the strategic use of IT through the wording of an IT scenario.

6. IT SCENARIO MODEL

The IT scenario model is an instrument for SMEs that provides insight into the strategic application of information technology from a broader meso perspective. The role of the model is to raise the awareness of people concerning IT by stimulating learning processes that will positively influence mental models. The IT scenario model contains three main components: the environment, six phases, and three aspect areas (figure 2).

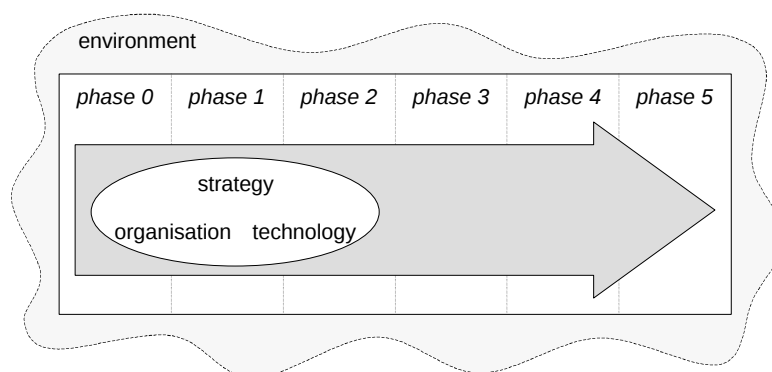


Figure 2: IT scenario model

The Environment Component

The contents of the environment component is mainly deduced from the scenario planning method and is related to uncertain developments that occur at the macro and meso levels. This concerns matters like macro-economic, technological, demographic, and market developments. The communication of relevant environmental developments increases the awareness of the entrepreneur concerning the contextual environment. Specific development at the branch or supply chain level are dealt with in the phases component.

The Phases

The division of phases is an essential part of the model, as it provides the basis for the evolutionary nature of the application of IT in relation to external business aspects. Matters like vertical and horizontal integration and supply chain reversal are dealt with in this. The IT scenario model encompasses six phases (table 6) and these are taken from the IT growth-phase models of Venkatraman (1991), Tan (1995), and Stroeken & Coumans (1998). This provides the opportunity to compare operationalised versions of the different models. With focused communication of the contents of the phases to entrepreneurs in SMEs, the recognisability and distinctive capacity of the six phases are of extreme importance.

Table 6: The phase division of the IT scenario model

<i>Phase</i>	<i>Description</i>
0	No usage of information technology
1	Internal oriented functional integration
2	Internal oriented multifunctional integration
3	External oriented process integration
4	Business process redesign
5	Business scope redefinition under influence of IT

- Phase zero is related to situations in which no form of IT is used in the enterprise, with the exception of simple variants like a fax machine. A considerable portion of Dutch SMEs can be placed in this category.
- Phase one is aimed at the computerisation of existing activities to improve efficiency. As a result, the emphasis is placed on internally oriented integration of existing activities. Often programs are used to register part of or all of the information flows from the primary process. In larger companies this is done by ERP packages (Enterprise Resource Planning) and in SMEs standard, integrated programs generally are used.
- In phase two the improvement in effectiveness is realised through internally oriented multifunctional integration. This lends more depth and breadth to the integration mentioned in phase one and the programs from phase one is applied in a more advanced and refined way.
- Phase three is aimed at the improvement of the present product-market combination through a type of process integration, in which a greater emphasis is placed on the externally oriented improvement of business processes. This means that the strategic position of the enterprise in the market and supply chain is the focal point of attention. IT is implemented in such a way that it makes a fundamental contribution to the customer approach and supply chain integration.
- Phase four encompasses the redesign of business processes to extend the external orientation. As a result, the enterprise has the ability to orient itself towards innovative product-market combinations. IT functions more as *enabling technology* in this phase.
- Phase five is related to the revision of business goals under the influence of IT, so that the enterprise undergoes a complete external re-orientation.

Moving through the six phases can be viewed as a cyclical innovation movement. Before an enterprise can focus on a new innovation cycle, or higher phase, it must meet certain phase-specific boundary conditions. These boundary conditions are given in three aspect areas. It is assumed that the provision of information regarding the three aspect areas leads to the adoption and implementation of IT in these three areas.

The Aspect Areas

The aspect areas are related to the elements of content or boundary conditions that hold for each phase. The elements are related to three aspect areas in the model: strategy, technology, and organisation. They are taken from the consistency model of Scott-Morton (1991), the strategic alignment model of Venkatraman (1991), the IT growth-phase models described and the concepts from innovation literature described in Tornatzky & Fleischer (1990). In the three tables below the elements are given for each aspect area. The three aspect areas are complementary, which means that the contents of the aspect areas cannot be clearly delimited.

Table 7: The aspect area of strategy

<i>Element</i>	<i>Description</i>
Main feature of the strategy	- The main feature of the strategy indicates what the essence of the business strategy is in a particular phase: efficiency improvement, effectiveness improvement, improvement of the product-market combination, renewal of the product-market combination or a totally new business orientation. - This point is related to the above point and covers the support of existing functions, the integration of existing functions, and the redesign or redefinition of functions. - An IT plan gives the strategic vision in relation to the use of IT. The degree of attunement between the IT plan and the business plan can be divided into various stages.
The function of IT	
The IT plan	

Table 8: The aspect area of technology

<i>Element</i>	<i>Description</i>
The business processes	- The strategic vision has various implications in each phase for the technical and organisational structure of the business processes. One important point of departure is the data structure. - For each phase we can indicate which information flows can be supported by IT in the data structure. - In relation to above two points, the IT applications are specifically named.
The data structure	
The IT applications	

Table 9: The aspect area of organisation

<i>Element</i>	<i>Description</i>
Organisation and tasks, authorities and responsibilities	- The implementation of IT brings about changes in the internal and external organisation. This has implications for the relations between business processes. With this, changes occur in accompanying tasks, authorities, and responsibilities. - Schooling plays an essential part in the acceptance and actual use of IT and employees must become familiar with the strategy and operational aspects of IT. - Once the technology has been adopted, the management of the technology has to be organised. - As regards the above points, the attitude of the management is crucial to success. Clear definitions have to be given of the roles and relations between the management and the users.
Schooling	
Management of technology	
Management and users	

The approach to operationalise parts of the IT scenario model is based on four steps. The first step concerns the environment component of the IT scenario model and encompasses the construction of a generic branch scenario. It has been indicated that the number of scenarios to be constructed is closely related to the number of recognised environmental uncertainties. The knowledge level concerning environmental developments (branch, supply chain, technology, etc.) generally is low in SMEs and as a result the information provided to the entrepreneur is somewhat limited through the construction of one, less detailed scenario. This also becomes clear from the discussion about sources and channels of communication. In the second step, the six phases, as kinds of subscenarios, are elaborated in which the insights gained from the generic branch-specific scenario are applicable. For each phase the external and internal changes are mapped regarding the market, supply chain relations, products and services, and business processes. In the third step the aspect areas strategy, technology, and organisation are elaborated. The accompanying elements of these aspect areas are dealt with in tables 7, 8 and 9. The final step encompasses the transformation from the branch-specific operationalised phases to a practical and feasible communication concept. As such it can be implemented as a concrete instrument to inform a clearly defined group of entrepreneurs about developments in the market, branch, supply chain, and IT, and what opportunities there are for the strategic application of IT in the enterprise. It is of importance to take into account the fact that different communication sources and channels (e.g. interpersonal or mass media) have different degrees of influence on the adoption phases of knowledge, persuasion and adoption in the adoption process of an innovation (cf. Nilakanta & Scamell, 1990; Rogers, 1995). Due to the relatively restricted interaction options, mass media channels have less influence on the persuasion phase than interpersonal means of communication, but they do offer ample means to provide signalling information to potential adopters in the knowledge phase (Attewell, 1992). However, Nooteboom et al. (1992) indicate that due to the high degree of tacit knowledge in SMEs, the adoption phase is better served by interpersonal contacts. Lind & Zmud (1991) state that the communication channels that are capable of transferring a higher degree of information richness have more impact on the innovativeness of the potential adopter. The richness of information, according to Lind & Zmud (1991: 198) is related to 'the potential for information being communicated through a channel to overcome different frames of reference held by communication partners or to clarify ambiguous issues such that joint understanding between the partners is enhanced.' Rogers (1995) relates the above to the potential for mutual understanding through the presence of a degree of homophily between the communicating individuals in the areas of background, education, social status, religion, etc. If we take all this and apply it to the IT scenario, then

we can conclude that the communication concept can be structured from a balanced combination of a multimedia mass medium (CD-ROM or website) and an interpersonal communication channel (consultant).

7. OPERATIONALISATION OF THE IT SCENARIO MODEL FOR THE FURNISHING BRANCH

The IT scenario model is operationalised for the furnishing branch, as a part of the retail trade, because the retail trade represents a considerable share of the total number of companies in the Dutch economy, the level of computerisation of retail trade SMEs is relatively low, and the furnishing branch largely produces to order and therefore information and knowledge exchange in the supply chain is essential (OECD, 1995; HBD, 1997, 1998; EIM, 1998). From this we can deduce that the smaller furnishing shops with less than 10 employees are in phase zero and the medium-sized shops (with between 10 and 100 employees) can more often be categorised in higher phases. The furnishing branch focuses on the sale of living room and bedroom furniture, cupboards, kitchens, floor coverings, wall paper, and lights. Within the Dutch furnishing branch we can distinguish five types of companies: furniture stores, bedroom furnishing stores, wall and floor furnishings, mixed businesses, and other businesses like kitchen stores, and cork and parquet flooring businesses.

The operationalisation of the IT scenario model was realised through interviews with the following bodies:

- The branch organisation of the furnishing branch. This organisation is an association of entrepreneurs in the furnishing branch that protects the collective and individual interests of entrepreneurs in the fields of product liability, shopping hours, certification, and supply chain-oriented computerisation protocols.
- Two large retail organisations in the Netherlands. Core activities of these organisations include being a supplier, retail trade activities, and commercial and business services to independent entrepreneurs in the fields of market research, sales concepts, promotional activities, and computerisation services.
- Some IT suppliers who develop, install, and maintain hardware and software products specifically for the furnishing branch.
- Two regional training centres that provide information to SMEs about computerisation through their so-called knowledge-transfer points.
- Some small and medium-sized enterprises in the furnishing branch.

As not all of the operationalised parts of the model can be given in this paper, we have opted to ignore the environmental component. In addition, the phases zero to five are given in brief, which means that matters like tasks, authorities and responsibilities, schooling, and management and user aspects are only discussed in brief. For a complete and detailed representation of the operationalised model see Stroeken & Knol (1999). The term computerisation compared to the term IT seems to better match the frame of reference of the entrepreneur in the furnishing branch and therefore computerisation is used consistently in the phases below.

Phase zero is related to the situation in which the furnishing shop does not make use of computerisation. This means the entrepreneur has made an implicit or explicit strategic choice not to professionalise the enterprise through computerisation. Phase one entails mostly small enterprises that pay limited attention to the strategic position of the enterprise in relation to the application of forms of computerisation, due to their limited knowledge, lack of complexity, lack of co-ordination, and limited means.

PHASE 1: COMPUTERISATION AIMED AT A FUNCTIONAL, INTERNALLY ORIENTED INTEGRATION

Strategy

The strategy of the enterprise in this phase is focused on raising the efficiency within the furnishing shop. The function of computerisation is especially focused on the support of existing functions. One example is the structural registration of order data with an order processing program. The role of the IT plan generally is limited in this phase. If there is an IT plan, it is not tuned to the business plan or the business strategy.

Technology

The computerisation in this phase is especially related to the internal data structure of the following business processes: management, personnel process, administration, service, sales, purchasing, stock and supply. The following computer applications can be mentioned for this phase: an order processing program, accounting program, word processing program, ATM machine (Automated Teller Machine), electronic cash register (not in all types of companies), a CAD system (i.e. Computer Aided Design; not for all types of businesses), a fax, and spreadsheet program. The hardware consists of separate computers with accompanying peripherals. There are hardly any or no data links between the computer applications mentioned above. Figure 3 gives an overview. For each relevant business process, information is given about the computerised data and the accompanying type of computerisation.

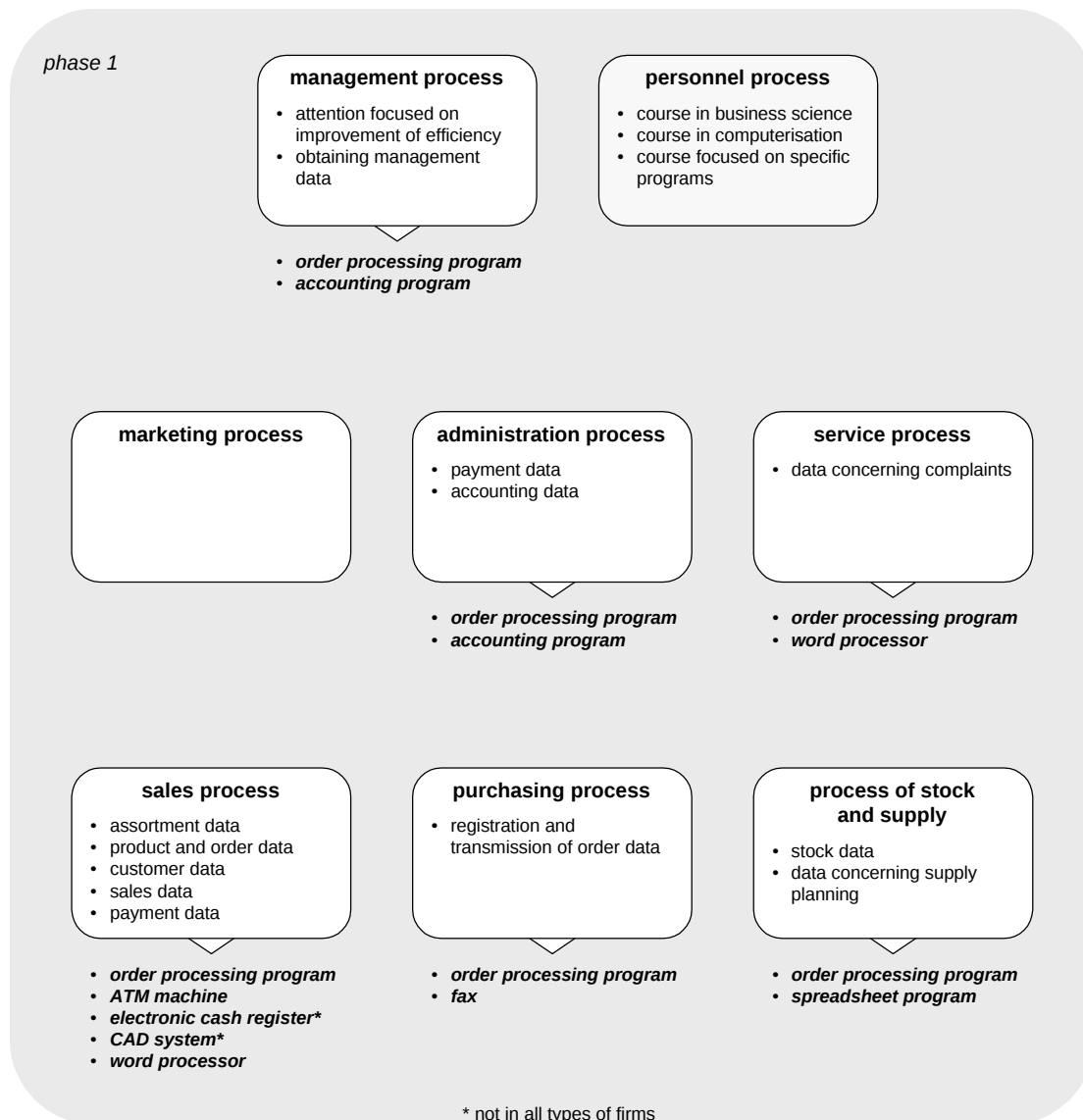


Figure 3: Computerised data and computerisation in phase 1

Organisation

The use of computerisation has implications for the organisation of the furnishing shop (structure, functions, and schooling). The structure of the organisation changes because the application of computerisation alters the shape of the business processes. In the sales process, for example, the order processing program is used to register matters like product data, orders, and customers, and therefore this program holds an important position within the business process. This means that tasks, authorities, and responsibilities have to be organised regarding regular activities and activities related to the use of computers. The same applies to the technical operational maintenance of the computers (installing, updating, copying, and making back-up copies). The management of computers is an important subject and is nearly always organised by the entrepreneur in this phase. The role of the user in the adoption process of computerisation in this phase is limited and management in particular needs to gain insight into the strategic role of computerisation. The following schooling is required: an introductory course in business science (business strategy, organisation, business processes, and customer services), an introductory and general course about the strategic use of computerisation, a course about the operational use of computerisation, and a course about specific applications (order processing program, accounting program, CAD program, etc.). For more information, the following parties can be consulted: the accountant, the branch organisation, the purchasing combinations, regional training centres, and IT suppliers.

Phase two is a deepening and broadening of the contents of phase one, aimed at the improvement of the effectiveness of the enterprise.

PHASE 2: COMPUTERISATION AIMED AT A MULTIFUNCTIONAL, INTERNALLY ORIENTED INTEGRATION

Strategy

The strategic attention in this phase is focused on the effectiveness of the enterprise through the use of computerisation. Among other things, this is realised by obtaining more insight into turnover per product, product group, manufacturer, period, or floor surface. The accompanying function of computerisation is to support, improve, and integrate existing business functions. The

possible presence of an IT plan mainly consists of the applications of computerisation within the enterprise, in which it will only be partially related to the business plan.

Technology

The use of computerisation is related to nearly all the business processes in this phase, but the degree of use will differ from process to process. In the last phase some business processes were mentioned that are related to the use of computerisation. In this phase some new business processes are added and some processes are extended or renewed regarding the use of computerisation. We are dealing with the following new and renewed business processes: management, personnel process, marketing, administration, and sales. The following extra computer applications can be mentioned in this context: a more extensive application of the order processing program and tele-banking facilities. The programs and equipment now have closer links. In figure 4 the computerised data and accompanying types of computerisation are depicted per relevant business process (bold and italics). Types of computerisation from the previous phase are given in normal typeface.

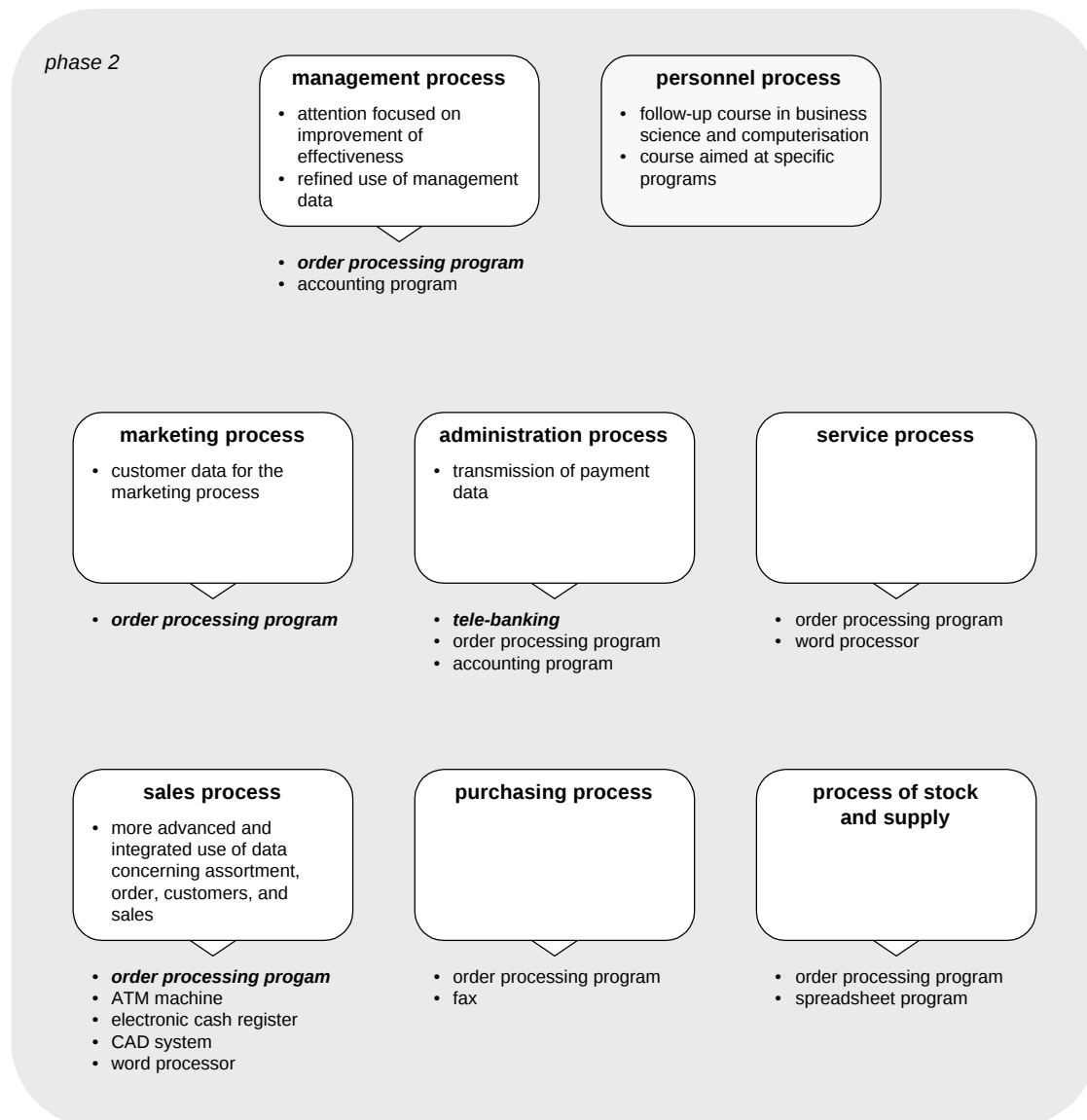


Figure 4: Computerised data and computerisation in phase 2

Organisation

The structure of the organisation changes through the application of computerisation in the four business processes mentioned earlier. Tasks, authorities, and responsibilities concerning the regular and computer-related activities must be adapted to the new situation. The computer management often is in the hands of the entrepreneur, though it can also be in the hands of a close employee, the IT supplier (via leasing contracts and other contracts), or a part-time manager (a costly option). Considering the increasing complexity of the computerisation to be used, schooling becomes increasingly important. The following types of schooling are needed in this phase: a follow-up course in business science (business strategy, organisation, business processes, and customer service), a follow-up course concerning the strategic role of computerisation in and around the enterprise, and specific courses aimed at the use of specific computer applications, such as the order processing program and tele-banking. The following parties can be consulted for information and advice: branch organisations, banks, purchasing combinations, regional training centres, and IT suppliers.

Phase three is related to enterprises that have advanced applications of computerisation. The smaller enterprises have to strongly reconsider their strategic position in this phase.

PHASE 3: COMPUTERISATION CONCERNING AN EXTERNALLY ORIENTED PROCESS INTEGRATION

Strategy

Compared to the previous phases, phase three and higher are more related to the external orientation of the enterprise, in which forms of integration in the business sector (intensification of the relations with suppliers and customers) in relation to the branch and market developments are of major importance. As a result, the strategic attention is focused on the creation of an advantage with the present product-market combination and raising the effectiveness of the external communication with customers and suppliers, among others. A strategic option relevant in this phase is the franchise construction. In addition, it is wise for the smaller furnishing shops to reconsider their strategic position, in which options like scale enlarging, segmentation, and specialisation can be important points of attention. The function of computerisation is to support and improve existing business functions for the creation of added value within the present products and service package. The IT plan is largely based on the business plan.

Technology

The computerisation is aimed at practically all business processes and in comparison with the previous phase, the degree of computerisation per business process is intensified in this phase. Some business processes are extended or undergo renewal. The following new business processes are of importance: management, personnel process, marketing, administration, sales, purchasing, stock and supply. In this phase we deal with the external data structure in relation to parties like present customers, prospects, suppliers, the accountant, and tax office. The hardware consists of linked computers in a LAN configuration (Local Area Network). The following extra computer applications can be mentioned: Internet and e-mail, EDI (Electronic Data Interchange), barcode scanner, and a portable ATM machine. In figure 5 the computerised data and accompanying types of computerisation are depicted per relevant business process (bold and italics). Types of computerisation from the previous phase are given in normal typeface.

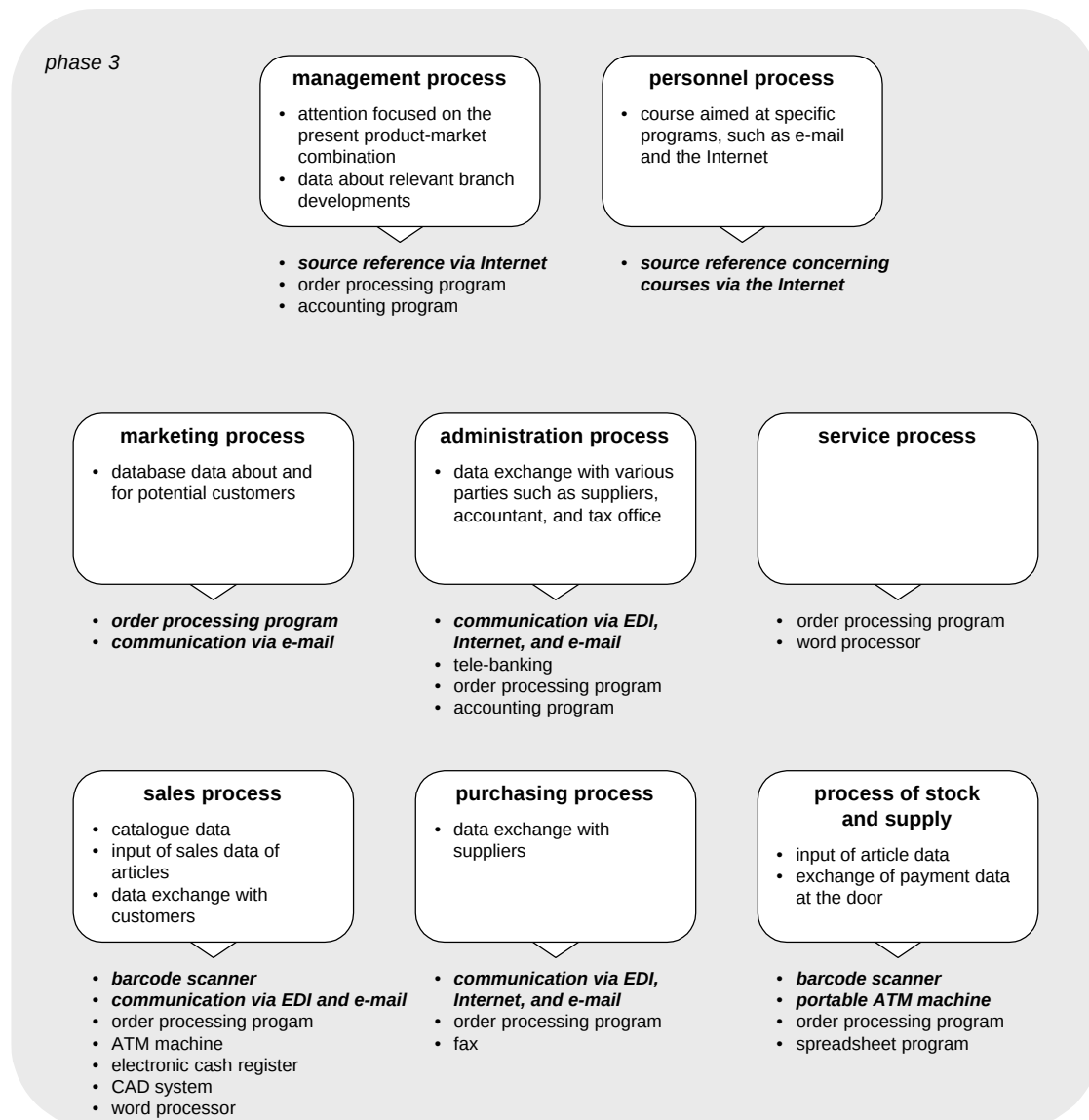


Figure 5: Computerised data and computerisation in phase 3

Organisation

In this phase we can assume that the organisation of the enterprise has been reasonably adapted to the use of computerisation and that tasks, authorities, and responsibilities are reasonably organised. The computer management is mainly in the hands of the entrepreneur, though it can also be in the hands of a close employee, the IT supplier (via leasing contracts and other contracts), or a part-time manager (a costly option). Schooling is strongly oriented towards supply chain developments and specific computer application of an external nature, such as forms of electronic communication via EDI, e-mail, and the Internet. The following parties can be consulted for further information: branch organisations, banks, purchasing combinations, regional training centres, and IT suppliers.

Phases four and five focus on the larger furnishing stores with possible outlets. For smaller shops phases four and five are less relevant, with the exception of innovative enterprises.

PHASE 4: COMPUTERISATION AND THE EXTERNALLY ORIENTED REDESIGN OF BUSINESS PROCESSES

Strategy

The strategic attention in this phase focuses on the creation of extensions to the product-market combination. This mainly entails the creation of new forms of service through the application of computerisation among other things. The marketing aspect is extremely important; entering into a franchise construction can be a strategic option in this phase. The function of computerisation is to realise added value to the one-to-one service to be created. In this phase the IT plan must be derived from or integrated with the business plan.

Technology

The applicable computerisation is aimed at all business processes and in comparison with the previous phases there is further extensification of the degree of computerisation. The following new and renewed business processes are of importance: personnel process, marketing, sales, and purchasing. The attention is strongly focused on the externally oriented data structure. The hardware consists of linked computers in a LAN configuration and there are many software links between business processes within and outside the enterprise (suppliers, customers, service industries, etc.) The following extra computer applications can be mentioned: learning applications via CD-ROM and/or the Internet, a strategically designed website on the Internet, an information terminal, multimedia computer for the visualisation of products and PDI-like structures (Product Data Interchange; integration of the order processing program, multimedia and EDI). In figure 6 the computerised data and accompanying types of computerisation are depicted per relevant business process (bold and italics). Types of computerisation from the previous phase are given in normal typeface.

Organisation

In this phase the organisation of the enterprise is adapted to the use of computerisation. The tasks, authorities, and responsibilities concerning regular and computer-related activities usually are organised. The computer management is in the hands of the entrepreneur or an expert employee, in which the IT supplier or part-time manager can lend support. Considering the increasing complexity of the computerisation required, schooling remains essential: a course about the strategic use of specific forms of computerisation, such as a website, multimedia computer, and PDI-related matters. Information can be obtained from the following parties, among others: branch organisation, purchasing combinations, regional training centres, and IT suppliers

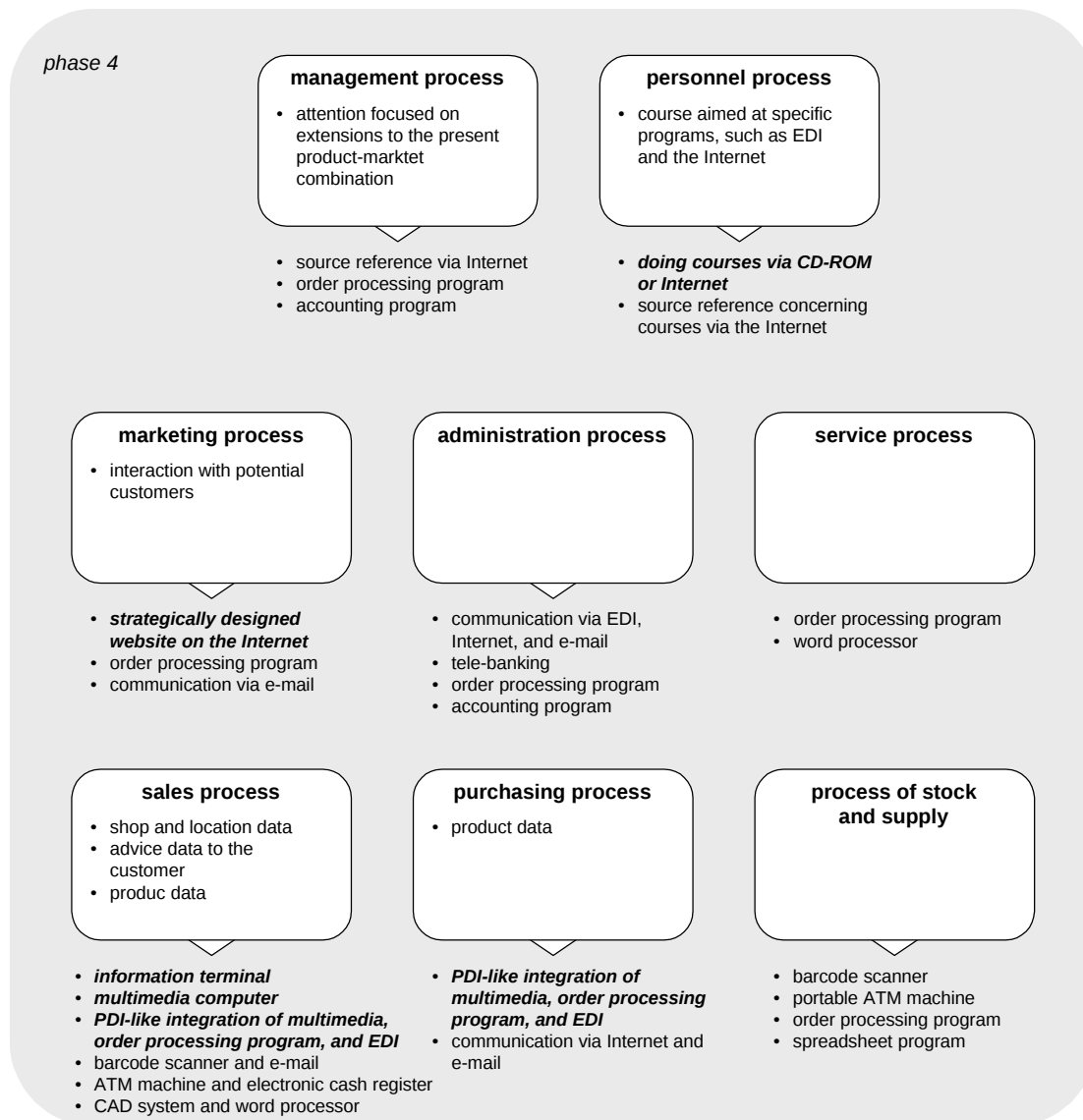


Figure 6: Computerised data and computerisation in phase 4

Phase five indicates that entirely new product-market combinations can be created under the influence of computerisation. Numerous combinations are possible and two examples are given in the phase description below. Phase five is less applicable for small, specialised furnishing shops, with the exception of innovative enterprises.

PHASE 5: REVISION OF BUSINESS GOALS UNDER THE INFLUENCE OF COMPUTERISATION

Strategy

The strategic attention in this phase is focused on the creation of new product-market combinations by using computerisation among other things. The function of computerisation is to create new products and services and to this purpose the IT plan has to be integrated with the business plan. Below two examples are given of new product-market combinations:

1. An enterprise completely oriented towards the Internet, in which the products and/or services are offered and sold exclusively on the Internet. This means that business processes like sales, purchasing, marketing, and services are mainly dealt with through the Internet. This example is less suitable for the furnishing branch in principle, as the purchase of furnishings is based on emotions; potential customers want to touch and feel the papers.
2. The enterprise as 'turn-key furnishing co-ordinator'. This type of enterprise is specialised as a kind of project integrator and turns customer demands regarding the complete furnishing of a house into projects for the products and service industries, such as interior decorators, plasterers, furniture manufacturers, carpenters, wall paperers, and lighting experts. Computerisation supports the structural co-ordination of the projects, in which PDI-like communication protocols are used.

Technology

Computerisation plays a considerable role in the example businesses mentioned and supports the integration of the business processes. There are many links present with the business processes of other organisations (suppliers, partners, customers, third parties and others). As regards the first example company, the following integrated computer applications are relevant:

interactive website in which the relevant business processes are present and integrated (front office), back-office software to control and manage the many business processes through databases and on-line communication lines with suppliers. As regards the second example company, the following integrated computer applications are relevant: database applications to determine the assortment of the various suppliers, multimedia software for the sales process (advice, tender and order), on-line communication lines with the many suppliers, and software to co-ordinate the project management.

Organisation

In this phase the organisation of the enterprise is completely tuned to computerisation, as computerisation is the enabler for the business strategy. Computerisation has a strongly integrative function in the enterprise, which means the tasks, authorities, and responsibilities must be clearly agreed upon. The computer management is in the hands of a very expert employee, in which the IT supplier or part-time manager can offer support. Schooling must focus on the way to operate in new markets, the redefinition and design of new business processes and functions, and strategic application and use of specific computer applications. Information can be obtained from the branch organisation, purchasing combinations, regional training centres, and IT suppliers.

In order to test the operationalised model, it was used as a frame of reference in part of the enterprises in question within the Rotterdam project 'Haal meer uit je computer' ('Get more from your computer'). This pilot project focuses on raising awareness of entrepreneurs concerning the application of IT through advice from teachers and the regional training centres involved, modules about branch and computerisation developments, and a branch-specific, informative CD-ROM with a diagnostic component that can generate a brief IT plan. The project is aimed at a group of about thirty entrepreneurs in the hair-dressing, clothing, and furnishing branch. Stroeken & Knol (1999) give an extensive description of the project. The IT scenario model was used as a frame of reference in ten furnishing shops to analyse to what extent the contents of the phases matches the actual situations the enterprises in question are in. No research was done to see whether the IT scenario model really influences awareness. All things considered the IT scenario model provides insight into the strategic application of IT in companies and supply chains for each phase and can depict these concretely. Thus it can be assumed that the representation of general branch developments and business-specific matters per aspect area of strategy, technology, and organisation influence learning processes and therefore raises the awareness regarding the strategic application of IT.

8. CONCLUSIONS

Small and medium-sized enterprises (SMEs) are somewhat behind concerning the application of information technology (IT) and therefore it is necessary to stimulate the diffusion and adoption of this technology among this group of enterprises. The core point is to raise the awareness concerning the strategic application of IT. To influence this awareness a so-called IT scenario model was developed in this paper. Theoretical insights regarding knowledge, learning, and mental models are its foundation. The model is a combination of scenario planning methods and so-called IT growth-phase models. It is composed of three main parts: an environmental aspect, six phases, and three aspect areas. On the basis of interviews with branch organisations, purchasing combinations, IT suppliers, schooling institutes, and entrepreneurs, the model was operationalised for the furnishing branch.

The innovation process is a learning process and within this context the IT scenario model offers possibilities to support learning processes about the strategic use of IT through information and advice to individual companies in a particular branch. Thus, the model has an important role in the diffusion and adoption policy for IT in SMEs (OECD, 1995; La Rovere, 1996). In relation to this, the model also influences learning processes at a higher level of abstraction concerning policy about and the execution of innovation processes in institutions like the national government, umbrella organisations aimed at SMEs, and individual branch organisations.

The IT scenario model is the focus of this paper. Future research should first focus on the transformation of the model into a concrete, interactive application on CD-ROM or on a website, so that entrepreneurs can obtain specific information. With this the implications of the application of the model to the strategic innovation behaviour of SMEs can be evaluated and tested. To optimise this process, it would be desirable to broaden the research to several branches, because more viewpoints can be gathered about the role of branch-specific IT scenarios in the diffusion and adoption process of IT in SMEs.

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