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The Editor's Corner

The journal continues focusing on the transition research and emphasizing openness to different research areas, topics, and methods, as well as international and interdisciplinary research nature of scholarly articles published in the journal. The current issue covers topics of the impacts of nanotechnologies, political and economic risk, outsourcing and virtualization, working capital efficiency, and consumer house-buying behavior.

This issue begins with a paper written by Ingrid Ott, Christian Papiloud and Torben Zültsdorf, who investigate the impacts of nanotechnologies from the perspective of the overall innovation in downstream sectors and further developments in nanotechnologies. In the second paper, Carl B. McGowan, Jr. and Susan E. Moeller present the study of decisions by using variables for political and economic risk analysis. In the third paper, Massimo Manzin and Borut Kodrič study the influence of outsourcing, information and communication technology on virtualization of an organization. In the fourth paper, Azhagaiah Ramachandran and Muralidharan Janakiraman examine the relationship between working capital management efficiency and EBIT. In the fifth paper, Mateja Kos Koklič and Irena Vida examine consumer house-buying behavior from a consumer perspective.

Boštjan Antončič
Editor

What Drives Innovation? Causes of and Consequences for Nanotechnologies

Ingrid Ott
Christian Papilloud
Torben Zülsdorf

Nanotechnologies are expected to be the dominant general purpose technology of the next decades. Their market potential is immense and not only supply-side but especially demand-side arguments will have far reaching consequences for innovations. The latter may occur as increased miniaturization or via building completely new products, processes or services. Innovations in the field of nanotechnologies do not only affect productivity in downstream sectors but these feed back to nanotechnologies thereby inducing circles of continuing innovation. Demand for nano-components mainly arises from firms while private demand is assigned to final products, processes or services that are augmented by nanotechnologies. Due to the technology's controversial character, the consumer's attitude towards risk and technology affects private demand and this may either spur or hamper innovation. The paper aims to unravel how these complex interdependencies and feedback mechanisms affect overall innovation in downstream sectors that is induced by nanotechnologies and how this for its part affects further improvements of nanotechnologies.

Key Words: general purpose technologies, controversial technologies, determinants of innovation

JEL Classification: O33, Z13

Introduction

Future decades are expected to be largely dominated by increased utilization and spread of nanotechnologies. This term broadly refers to tech-

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nologies and devices whose unifying theme is the control of matter at an atomic and molecular scale, namely with critical dimensions smaller than 100 nanometers. The manipulation of nanostructures leads to the observation of completely new phenomena and with this prepares the ground for considerable innovations. The goal of this paper is to give an overview on some most important lines of argumentations relevant in the context of the complex innovation process of nanotechnologies. In doing so the paper provides a theoretical framework for discussing the potential but also possible frictions of that newly emerging technology.

Permanent innovation is especially important for those countries that are poorly endowed with natural resources in order to be competitive at an international level and to realize ongoing growth (see e. g. Barro and Sala-i-Martin 2004; Acemoglu 2009 for a recent overview on the link between innovation and growth). A more precise look at innovation determinants reveals that it is possible for most eras to identify a certain technology that has a key function for the generation of innovations in other fields (see e. g. Rosenberg 1992). This has led to the distinction in drastic and incremental innovations. Drastic innovations frequently spur incremental innovations in complementary fields thereby introducing far-reaching economic and societal effects. If drastic innovations have the potential for pervasive utilization – as e. g. the steam engine, electricity or the computer – they are called *general purpose technologies* (see e. g. Bresnahan and Trajtenberg 1995 who coined that term).

Although they may basically be used in a variety of applications this neither implies any automatism concerning diffusion nor that efficiency considerations are the only determinant driving demand for the new technology. This argument becomes strikingly obvious in the context of so-called *controversial technologies* – a notion stating that it is not per se clear whether, from an aggregate point of view, chances or possible risks of the innovation dominate (biotechnology or nuclear power are some prominent examples of such a kind of technology). Given this, individual attitudes towards technologies and risk become important for the development and diffusion of the innovation. In the extreme, failing public acceptance may interrupt the innovation process.

One might conclude that usually innovation processes are driven by demand-side as well as by supply-side arguments, in which each position holds a certain role. Throughout this paper *supply-side arguments* will be discussed in the context of general purpose technologies, thereby including a microeconomic and a macroeconomic perspective. From the point of view of single firms, the most important are externalities and feedback

effects that arise along the value chain. As a consequence too few innovations are realized, and on top of that they arise too late. The aggregate perspective adds further arguments, namely the impact of general purpose technologies on total factor productivity. Following the logic of the so-called productivity paradox, the implementation of a new general purpose technology only enhances overall productivity in the long-run whereas, due to costly adjustment processes, in the short-run even productivity losses may arise. A second perspective focuses on *demand-side arguments* mainly arising in the context of controversial technologies. These approaches do not focus on pure technological aspects but lay emphasis on the needs, preferences and the utility of the users.

Several features qualify nanotechnologies as the future dominating *general purpose technology*. One is pervasiveness, since the technology may be utilized in lots of animate and inanimate fields. Due to their tiny size nanotechnologies are used at the origins of the value creation chain and induce high technological dynamics. Improvements in nanotechnologies also affect productivity in the downstream sectors, which due to technological dynamics, again spurs innovation in the upstream technology. As a consequence, not only production but also innovation processes are vertically linked, at which the latter interdependency runs in both directions along the value creation chain. But aside from this, nanotechnologies are also understood as representing a *controversial technology* and great efforts are made to avoid interruptions in the innovation process that might arise as a consequence of failing public acceptance.

The remainder of the paper is as follows: the second section presents determinants and economic aspects of general purpose technologies. The third section analyzes supply-side and demand-side arguments of innovation in the case of controversial technologies. The fourth section applies the arguments detailed before on the case of nanotechnologies. The fifth section briefly concludes.

Economic Aspects of General Purpose Technologies

DRASTIC VERSUS INCREMENTAL INNOVATIONS

In the simplest form, technological progress arises as an incremental process that improves the efficiency of resource deployment. It may not be uniform across sectors or time, but the aggregate effects are relatively smooth.¹ In contrast are major inventions that have had far-reaching and prolonged implications, such as the steam engine, electricity, or the computer. The distinction between drastic and incremental innovation is

useful, since frequently incremental innovations – although taking place in the regular course of business – follow drastic innovations. A drastic innovation, however, introduces a discontinuity in the organization of the economy in the sense that the innovation replaces an old technology that played a significant role in an industry with new methods of production. Or it replaces an old material that performed certain functions with a new one.²

Note that a discontinuity in this sense does not automatically imply a necessary discontinuity in the observed pattern of resource allocation or the evolution of output. The introduction of a superior technology can be gradual, starting with a negligible absorption of resources which is followed by continuous expansion over time.³ It is nevertheless helpful to distinguish between drastic and incremental innovations since the latter frequently are triggered by drastic innovations. Put differently, drastic innovations induce series of incremental (and often complementary) innovations.

The distinction between drastic and incremental innovations is also helpful with respect to their emergence: It is possible that forces driving incremental innovations are different from those that drive drastic innovations. For example, incremental innovations are more susceptible to standard profitability calculations, even when they involve externalities and are subject to risk, simply because markets can evaluate their profitability. In contrast, drastic innovations face much larger uncertainties, producing risks that are much harder to evaluate by the market (see e. g. Rosenberg 1996). As a result, drastic innovators can engage little in risk-sharing and have to bear most of the risk themselves.⁴

PECULIARITIES OF GENERAL PURPOSE TECHNOLOGIES

A drastic innovation qualifies as general purpose technology if it has the potential for pervasive use in a wide range of sectors in ways that drastically change their modes of operation. To quote from Bresnahan and Trajtenberg (1995), who coined the term general purpose technology and provided a highly original discussion of its usefulness:⁵

Most GPTs play the role of ‘enabling technologies,’ opening up new opportunities rather than offering complete, final solutions. For example, the productivity gains associated with the introduction of electric motors in manufacturing were not limited to a reduction in energy costs. The new energy sources fostered the more efficient design of factories, taking advantage of the newfound flexibility of electric power. Similarly, the users

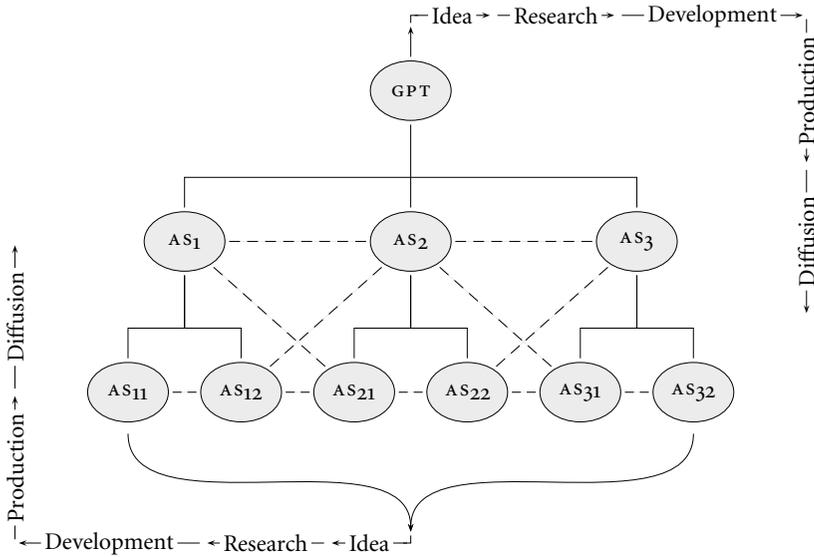


FIGURE 1 Generality of purpose and innovational complementarities (GPT – general purpose technology; AS – applying sector)

of microelectronics benefit from the surging power of silicon by wrapping around the integrated circuits their own technical advantages. This phenomenon involves what we call ‘innovational complementarities’ (IC), that is, the productivity of R&D in a downstream sector increases as a consequence of innovation in the GPT. These complementarities magnify the effects of innovation in the GPT, and help propagate them throughout the economy.

The description makes clear two most important features of drastic innovations that qualify as general purpose technologies: generality of purpose as well as innovational complementarities.⁶ When these effects are particularly strong, as for example in the case of electricity, information and communication technologies and the internet or henceforth nanotechnologies, they lead to considerable changes in economic organizations. Sometimes they also affect the organization of society through changes in working hours, constraints of family life, social stratification, and the like.⁷

One immediate consequence of pervasiveness are strong interdependencies between lots of actors along the value creation chain. Figure 1 contains a technology tree that illustrates horizontal and vertical linkages, that arise between the general purpose technology (denoted by

GPT) and downstream sectors (applying sectors, hence AS) which apply the technology. The generality of purpose is indicated by the vertical linkages while horizontal lines between the applying sectors illustrate that also firms at the same level of the value creation chain are basically interrelated. Figure 1 also contains two innovation processes (from the pure idea until diffusion) which are indicated by the outside arrows. One innovation process begins at the level of the general purpose technology and works downwards along the value creation chain. Diffusion then takes place via utilization of the general purpose technology in downstream sectors in which the technology plays the role of an intermediate input, and diffusion along the technology tree takes place in the form of a cascade. Additionally, figure 1 encompasses a second innovation process which, in turn, comes from the applying sector and goes back to the general purpose technology and hence runs upwards along the value creation chain. This indicates that inherent to the general purpose technology there is the potential of technological improvement that runs in two directions.⁸ The utilization of the general purpose technology by the downstream firms reveals potential for improvement and hence induces innovation processes in the upstream sector, namely the general purpose technology. This, in turn, induces improvements in the upstream general purpose technology which again feed back to downstream sectors and so forth.

As argued in the context of figure 1, numerous interactions exist between upstream and downstream sectors. These interdependencies do not only arise in a production context but also during the innovation processes within companies. They incorporate two fundamental externalities:⁹

- *Vertical externalities.* Due to innovational complementarities, the innovation activities in upstream and downstream industries are related, and firms in upstream and downstream sectors have linked payoffs. As long as each firm decides individually, it does not consider the aggregate effects arising from its individual action. Consequently, the well-known appropriability effect (namely the failing to appropriate the entire returns of individual activities) arises (see Helpman and Trajtenberg 1998). A familiar problem of imperfect access to the social returns arises, except that in the context of general purpose technologies it runs in both ways. This encompasses a bilateral moral hazard problem which implies that not any side, neither the upstream nor the downstream firm, will have sufficient

incentives to innovate. As a consequence, the innovation incentives along the entire value creation chain are too little with respect to the extent and arise too late.

- *Horizontal externalities.* Applying sectors include actual and possible users of the general purpose technology. Their demand depends positively upon the quality and negatively upon the price of the general purpose technology. At the same time, quality within the general purpose technology sector depends on marginal production costs and on the (aggregate) technological level of all applying sectors. Hence, if one single applying sector innovates to increase its own technological level (with the goal of reducing own production costs) also the aggregate level of all applying sectors will increase. This leads to improvements within the general purpose technology and hence to reduced costs not only in the originally innovating sector but also in the other (non-innovating) downstream sectors. However, as argued before, again the appropriability effect comes into action, and again this induces a moral hazard problem: Why should any applying sector innovate if it could benefit at zero costs from the innovation in another sector?

To sum up: As Bresnahan and Trajtenberg (1995) noted, general purpose technologies introduce two types of externalities: one between the general purpose technology and the application sectors (vertical); another across the application sectors (horizontal). The former stems from the difficulties that an inventor of the general purpose technology may have in appropriating the fruits of the invention. When institutional conditions prevent full appropriation, the general purpose technology is effectively underpriced and therefore undersupplied. The latter occurs since the application sectors are not coordinated and each one conditions its expansion of the available general purpose technology. If in contrast they coordinated a joint expansion, they would raise the profitability of the general purpose technology and encourage its improvement. A better general purpose technology fits them all. Consequently, coordination of a joint expansion – and with this the conditions of demand – are of major importance for the diffusion and thus improvement of the general purpose technology, which in the end benefits all.

GENERAL PURPOSE TECHNOLOGIES AND AGGREGATE GROWTH

From an economic point of view, general purpose technologies are not only interesting from a microeconomic perspective but they have also

some peculiarities with respect to their aggregate effect or, to be more precise, for aggregate growth. As has been widely shown by economic historians, in any given period, there exist some technologies that play a far-reaching role in the sense that they bring about sustained and pervasive productivity gains and which, in consequence, widely foster economic growth. Some examples are the steam engine during the industrial revolution, electricity during the first decades, or microelectronics in the second half of the 20th century. Nanotechnologies are expected to induce the next long-run wave.¹⁰ The basic argumentation is as follows: As an improved version of the general purpose technology becomes available it gets adopted by an increasing number of application sectors which, in turn, are accompanied by further advances, thus raising the attractiveness of further adoption. This increases the demand for the general purpose technology, thereby inducing improvements of the general purpose technology, which then prompts a new round of advances in the application sectors, and so forth. As the effects become significant at an aggregate level, the general purpose technology finally affects overall growth. However, even if substantially important in the long-run, new technologies may at first have no significant impact on actual growth, since they have to await for the development of a sufficiently large amount of complementary assets in the applying sector. Moreover, these assets use up resources and hence, in the short run, growth may even be negatively affected.

This latter aspect of the so-called ‘productivity paradox’ has been formalized e. g. by Helpman and Trajtenberg (1998) who develop a growth model which allows for studying the economy-wide dynamics that the emergence of a new general purpose technology may generate. Within this paper we just present a short sketch of the model’s simplest version without going into formal details, thereby assuming that advances in the general purpose technology are exogenous. Hence we abstract from analyzing the implications of innovational complementarities illustrated before. To keep the discussion simple we focus on the role of complementarity in the sense that the downstream sectors, which provide components that are complementary to the general purpose technology, and their incentives for innovation are of primary interest.¹¹ Figure 2 provides a simple illustration of the relevant interdependencies.

Figure 2 contains a stylized sequence of the emergence of a new general purpose technology which contains three cycles. Each cycle is denoted by Δ and describes a phase in which a certain general purpose technology,

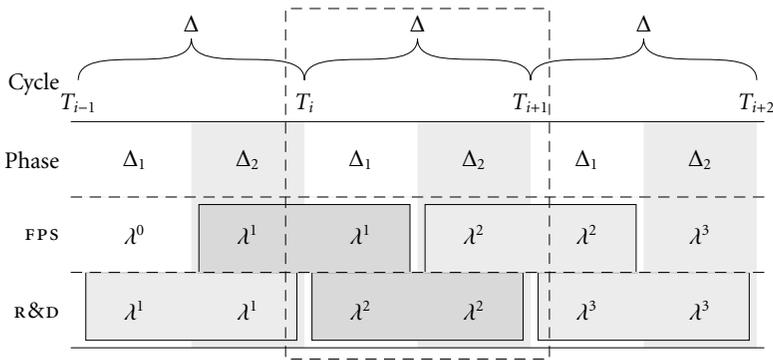


FIGURE 2 The importance of complements (T_1 – availability of GPT_1 , start of development of components for GPT_{i+1} , $T_i + \Delta_1$ – switch in the FPS to GPT_{i+1} , Δ – phase in which a general purpose technology is available; Δ_1 – phase with productivity decline; Δ_2 – phase with productivity growth; λ^i – general purpose technology at work; FPS – final product sector; R&D – research and development)

denoted by λ^i , is at work. The positive parameter i is ordinal and indicates the consecutive number of the current general purpose technology. The parameter λ is assumed to exceed unity, hence a newer GPT implies higher values of λ^i .

Since the general purpose technology is not a lonely standing technology but is applied to a variety of uses we distinguish the utilization within the final product sector (denoted by FPS) and in the component sector (denoted by R&D). Each cycle is divided into two phases, Δ_1 and Δ_2 ; both may be distinguished as follows: Within the first phase, Δ_1 , final output is manufactured with the old general purpose technology, λ^i , while innovators already develop components for the new general purpose technology, λ^{i+1} . Consequently, the number of components for λ^{i+1} rises over time. Note that the development of components for the next technology comes at the cost of negative output and productivity growth, stagnating real wages, and declining profit shares. In the second phase, Δ_2 , after a sufficient amount of components for the new general purpose technology has been developed, manufacturers of final output switch to the new technology, λ^{i+1} , while innovators still continue to develop components for this technology. Then the benefits of an advanced general purpose technology manifest themselves. As a consequence, output, real wages, and profits rise.

In figure 2 this becomes apparent while looking at the general purpose

technology at work within the separate sectors, namely the sectors for final goods production and the one for the development of components: While during Δ_1 two different general purpose technologies (e. g. λ^1 and λ^2) affect economic activity in the respective sector, Δ_2 is characterized by the overall utilization of the most recent general purpose technology (e. g. λ^2) in both the component and the final product sector.

To sum up: Within each cycle, the analysis shows the centrality that complementary investments play in the aggregate growth process. Above it is shown how the sequential and cumulative nature of such complementary investments may induce different phases along each cycle, each of them exhibiting very different features. Of special interest is the initial phase of negative or below average growth. This results from the fact that there exists a threshold level of complementary inputs that needs to be developed before the general purpose technology at work in final goods' production can be displaced by the newest one. Hence one has to carefully consider the time line in assessing the growth impact of general purpose technologies: while aggregate growth increases in the long-run due to productivity gains of the improved GPT and the complementary components (second phase), productivity initially declines as a consequence of parallel use of two GPT during the first phase.

Innovation and International Competitiveness

SUPPLY AND DEMAND SIDE ARGUMENTS

Until here the argumentation referred to the interdependencies between upstream and downstream sectors, the arising coordination problem that ends up in too little and too late innovation, and delayed growth effects induced by the general purpose technology. This perspective already underlines the fundamental point of the development of general purpose technologies, namely the role of demand. As we argue along the technology tree, not only demand for final products but also firms' demands that arise along the value creation chain gains importance.

As argued before, those theories that focus on the *supply-side* frequently stress the implications of knowledge as (at least a partial) public good. Innovative firms are not able to appropriate all returns that are generated by their innovation activities while they have to cover the entire costs. Consequently the incentive for innovation is sub-optimally low and the innovation process is accompanied by market failures. This justifies governmental intervention in the innovation process frequently

in the form of direct or indirect subsidies.¹² In addition, supply of new products, processes or services is also affected by national tax systems, the availability of qualified labor or other input factors, as well as by co-operation possibilities with component suppliers or other firms.

In contrast to this a relevant impact for continuous innovation stems from ambitious customers, the market structure as well as from economies of scale and scope in production. Picking up this argument, other approaches emphasize the role of the *demand-side* for the generation of knowledge, innovation and international competitiveness (see e. g. Linder 1961; Blümle 1994; Fagerberg 1995). These approaches do not focus on pure technological aspects but lay an emphasis on the needs and the utility of the users. Summarizing these arguments, Beise and Cleff (2004) or Gerybadze, Meyer-Kramer, and Reger (1997) focus on so called *lead markets* that enable promising technologies to emerge. Lead markets arise if there exists a critical amount of users, whose needs determine the quality of demand. *Lead users* (in contrast to ‘normal users’) may be characterized as follows: (i) they are precursors of a broad commercial market and hence early anticipators of global trends, (ii) they expect high utility from new products, processes or services, (iii) they claim for the implantation of ideas and inventions in final products, processes and services, and (iv) fall back on local resources. Aside from private individuals or firms, also governments may become lead users, e. g. by buying special products or services or by issuing research orders for them. Typically, the government is especially important in the field of cutting edge technologies, such as information and communication technology, aerospace industry or military technology.

LEAD MARKETS AND COMPETITIVENESS OF LOCAL FIRMS

The existence of a domestic lead market and hence high demand with respect to quantity, but also to quality, allows supplying firms first to meet local demand, then to activate exports and eventually to provide products, processes and services to a broad range of users and on international markets.¹³ Due to the market proximity local firms will be the first to notice the demand of new lead users. In detail the advantages can be grouped into:

- *Cost advantages.* Research and technology intensive industries are frequently characterized by economies of scale and scope. Hence, to benefit from the corresponding scale and scope effects in the form of cost degression, not only the current volume of domestic

demand but also the corresponding dynamics (the growth of demand) are important to assure international competitiveness. The positive scale effects are then magnified by the market volume.

- *Export advantages.* This summarizes effects such as representativity of domestic preferences for the world market, sensibility compared to changes of the demand conditions on the world market, the export ratio, but also linguistic and social compatibility with the advised market. Hence export advantages may arise if consumers on the home market prefer products and processes that have the potential to be successful also on other markets (see e. g. Beise 2001).

Firms in lead markets are the first to benefit from these advantages and this continuously secures a competitive advantage for innovative domestic firms (see e. g. Morrison, Roberts, and Midgley 2004)

ON THE ROLE OF PRIVATE DEMAND FOR CONTROVERSIAL TECHNOLOGIES

Inherent in innovative products and services is uncertainty. Therefore, individual risk attitude and risk perception become crucial for the actually existing private demand. The individual attitude towards technology and science also affect the preferences of domestic consumers. Individual openness towards new technologies is significantly affected by both anticipated utility and perceived risks. Slovic (1999) emphasizes that most notably the risk potential, its possible way to control it, the familiarity with risks and the public recognition determines how private individuals perceive innovations and hence drives demand for new products, processes or services. The following arguments gain especial importance:

- *Openness towards technology and science.* Inglehart (1997) states that a positive climate for innovation is the more probable, the more open-minded and tolerant a society is, since openness affects private demand for new products and services. Demand is at least in part affected by individual attitudes (openness towards new technologies, risk attitude – see below) as well as by norms that shape human interaction.¹⁴ Basically, the society's openness is crucial for the innovation climate in certain regions and it also differs if considering certain types of technologies. Typically, differences may be identified with respect to controversial and non-controversial technologies. While for the latter, utility clearly dominates possible risk it is unclear in the case of controversial technologies whether risks

or opportunities prevail.¹⁵ As a consequence these technologies are deeply ambivalent in the sense that strong opportunities go along with large risks.

- *Individual risk attitude.* Innovations are more likely to arise if the individuals are open-minded with respect to uncertainty. To operationalize the feature 'risk attitude' of private individuals usually the results from the Eurobarometer are used.¹⁶ It regularly monitors on behalf of the European Commission the public opinion. In this context, positive indicators for innovation are preparedness to carry risks and preferences for self employment.
- *Trust in innovation actors (science, firms, and politicians).* Science and research are especially credible in countries having the following attributes: objective and differentiated commentatorship on risks and opportunities, high public acceptance of institutional frameworks, if people trust in and cooperate with other citizens and if politicians are perceived to follow rules of good governance.

Observe that a differentiated perception and assessment of opportunities and risks of new technologies is not per se negative for the development of new technologies. In contrast: A critical discussion may help develop the technology in a promising way. If doubts or reservations with respect to special applications are carefully considered by science, industry and policy and if the social and economic framework is chosen adequately it is possible to shape a climate that is open-minded and hence helps propagate innovation (see Hüsing 2002). As will be discussed below, this aspect gains especial importance in the context of controversial technologies.

An Application to Nanotechnologies

NANOTECHNOLOGIES AS GENERAL PURPOSE TECHNOLOGIES

We now apply the argumentation detailed before on the case of nanotechnologies. They are perceived as being the next most important general purpose technology, and with this they are expected to affect economic and social life significantly within the next decades. The analysis begins with a brief illustration of why nanotechnologies actually qualify as general purpose technology, not only from a technological but also from an economic point of view. We then focus on the impact of demand, thereby relying on the argumentation carried out before.

Pervasiveness and technological dynamics. The generic function provided by nanotechnologies is its pervasiveness and the possibility to arrange single atoms. Nanotechnologies have huge potentials for improvement at the beginning of their development, are open to a multitude of possible uses, have an impact on nearly every part of economy and society, and can be embedded in already existing technologies. This causes major changes thereby affecting production structures, network relationships, and social differentiation. As such, nanotechnologies form part of technological platforms that organize future actions, and enable and constrain them (see research and development; also Robinson, Rip, and Mangematin 2006, 4ff.). Figure 1 demonstrates the interdependencies between several sectors, firms, and/or actors that utilize nanotechnologies within the production process. Looking at the simplest case, the hierarchical interdependencies as well as the network character are most suitably illustrated by a technology tree. Nanotechnologies represent the field of the general purpose technology. Since nanotechnologies are still at the very beginning of their technological development, further improvement is mostly provided by universities or research centers. This tempers the consequences of the appropriability effect discussed above in the sense that basic research in the field of nanotechnologies is financed by the public.¹⁷ Both universities and research centers frequently provide the basis for spin-offs which end up in the development of components that may be used as inputs in the applying sector (AS). Hence applying sectors reflect the downstream industries that actually or potentially make use of the general purpose technology or augmented products as intermediates. Note that remarkable efforts are being made to close the gap between science and application. One prominent way is the foundation of institutions that act as a bridge between universities/research centers and firms.¹⁸ Aside from vertical relationships, horizontal linkages exist between actors at the same level of the value chain.

In order to depict the development and implantation logics of nanotechnologies, let us give an example of a possible technology tree application. Nanotechnologies have many of applying sectors, such as, the chemical industry (AS 1), microelectronics (AS 2) or pharmacy (AS 3). New materials could be demanded by further downstream sectors such as aviation industries (AS 11, which use fire-resistant materials for in-board equipment), or automobile industries (AS 12, which use scratch-resistant lacquers).

Innovational complementarities. Additionally, ICT industries make

use of nano components to augment the calculating capacity of computers. Again, these are used by information technologies which have contributed significantly to the emergence of nanotechnologies. All illustrations of nano-scale effects and structures are based on digitally-constructed pictures. For more than thirty years, the capacity of computers has doubled every 12 to 18 months (Moore's law). However, within the next several years, physical boundaries will put an end to this development because, at nano-scales, the technological characteristics of solid state physics cease to hold and the usual transistor will be unusable. At this point, quantum physics will become relevant and molecules – manipulated by nanotechnologies – could replace the transistors known today. Consequently, technological progress in nanotechnologies becomes a precondition for future innovations in microtechnology, which anew spurs technological progress in the nanotechnologies sector.

Reorganisation of work-life processes. Applied to nanotechnologies, this argument is still diffuse because today these technologies are still at the very beginning of their development. But just to get a vague idea, one could imagine how, for example, intelligent materials that measure functions of the human body and transmit the results directly to medicine could enable people suffering from chronic illnesses to live their daily lives much less dependent on regular health checks or hospital visits.

These examples show quite plainly what one can easily observe within the field of nanotechnologies: the concrete and possible interactions within the technology tree require a lot of coordination, and consequently failures may arise.

DEMAND FOR NANOTECHNOLOGIES BY APPLYING SECTORS, AND CONSUMERS AND AGGREGATE EFFECTS

Although nanotechnologies are used at the very beginning of the value creation chain, at the end it is demand for final products that drives the demand for nano-intermediates. To facilitate the discussion we separate the two most important factors influencing demand, namely on the one hand, the price and the quality of the general purpose technology, and, on the other hand the utility derived by consuming a product that has been enhanced by nanotechnologies or that includes nano-intermediates.

Firm demand. As argued before innovations are too few and they arrive too late as a consequence of the prevailing externalities. Possibilities for internalization are at least twofold: At a vertical level the enforcement

of property rights gains importance. Here nano-patents may be a solution to spur innovation activities of firms along the entire value creation chain. On the other hand, horizontal externalities could be internalized by coordination of firms' demands that act at the same level of the value creation chain, e. g. firms in the aviation and the dockyards sectors could use the same scratch-resistant surfaces. Platforms for demand coordination could basically be provided by regional institutions.¹⁹ If successful, demand in downstream sectors increases, thereby allowing for making use of economies of scale in the field of the upstream nanotechnology.

Private demand. Like biotechnology also nanotechnologies are *controversial technologies*. Hence it is not *per se* clear whether, from an individual point of view, chances or risks prevail. The individuals' attitude towards technology therefore is central. Werwatz et al. (2006; 2007) provide a ranking of attitudes and technology acceptances of citizens over 17 countries that could be used as a country's indicator for having the potential to become a lead market in a certain technology field.²⁰ Taking an overall look at attitudes and acceptance of all technologies, the following becomes obvious: Denmark, Sweden and Finland dominate the first three ranks, except for risk attitude, where Ireland, South Korea and the USA are ranked first. For most indicators, Austria, Ireland and Spain bring up the rear.

With respect to controversial technologies – and hence also with respect to nanotechnologies – the following conclusions can be drawn: Nearly 90% of the citizens in the considered countries assign a positive effect to non-controversial technologies, whereas with respect to controversial technologies this rate declines to 60%. It is also possible to differentiate between single countries: While people in the US are optimistic with respect to both controversial and non-controversial technologies, citizens in the Netherlands, Belgium, Sweden, Germany, Finland or UK strongly differentiate with respect to certain technology fields. Within these countries non-controversial technologies achieve the highest acceptance rate, with Germany being the leader. This means that Germans are very optimistic with respect to low-risk technologies, but this optimism clearly decreases in case of controversial technologies. This may hamper the development of nanotechnologies in the critical countries. In contrast, observe that this differentiated attitude may become an advantage in the long-run since a critical discussion may provide the design of new products or even political or institutional frameworks that foster future innovation activities. Thus, the critical scepticism in the short run

may provide the basis for becoming a lead market in the long run if, as a consequence of the initially detailed discussion, products are created that fit the needs of a large amount of consumers. Hence, this disadvantage with respect to regional competitiveness may turn to a future advantage.²¹

That attitudes towards technologies diverge across societies has also been extensively discussed in the context of the debate on the so-called NBIC (Nano-Bio-Info-Cogno) convergence:²² NBIC-Convergence for Improving Human Performance is the name of a prominent agenda for converging technology research in the United States. In Canada, Bio-Systemics Synthesis suggests another agenda for converging technology research, whereas Converging Technologies for the European Knowledge Society (СТЕКС) designates the European approach. It prioritizes the setting of a particular goal for converging technology research. This presents challenges and opportunities for research and governance alike, allowing for an integration of technological potential, recognition of limits, European needs, economic opportunities, and scientific interests.

Long-run effects of nanotechnologies: Nanotechnologies are expected to introduce the next long-run wave, thereby providing continuous incentives for incremental innovation. As discussed before, it is inherent to general purpose technologies that their impact on overall productivity becomes significant only after sufficient complements are in the market and after the completion of important adjustment processes. Hence, although the recent market potentials of nanotechnologies are already immense, it will probably take several years or even decades until overall productivity has increased as a consequence of the use of the new general purpose technology.

Summary and Conclusions

This paper investigates the implications of innovation processes in the context of nanotechnologies. The focus as well as the corresponding discussion is twofold: nanotechnologies and their implications are analyzed as controversial and as general purpose technologies, thereby disentangling supply-side and demand-side arguments. As a drastic innovation, nanotechnologies induce innovation processes in downstream sectors which – due to feedback effects – in turn affect productivity and with this innovation in the upstream nanotechnologies. The analysis is carried out with special attention to supply-side and demand-side arguments. Since nanotechnologies are utilized at the very beginning of the value

creation chain it is necessary to disentangle different parts of total demand into firms' demand for nano-components and private demand for final products. With respect to the firms' demand the following gains importance: Innovation processes are interrelated along the value creation chain, and feedback mechanisms work in both directions: upstream and downstream. Due to the appropriability effect, innovating firms are not able to appropriate all benefits that are induced by their innovation activities. As a consequence, innovations arise too late and their extent is too low. On the other hand, nanotechnologies are highly controversial among consumers and it is not *per se* clear whether opportunities or risks in the use of final products that are augmented by nanotechnologies dominate. This again may hamper innovations in the fields of nanotechnologies, and the individual's attitude towards risk and technology becomes especially important. Both individual and firm's demand hence may be sub-optimally low with respect to a harmonized innovation process. However, interventions in the innovation process carefully have to consider at which level of the value chain they are realized.

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Notes

- 1 The incremental nature of technological process has been well documented by economic historians (see e. g. Rosenberg 1992).
- 2 Examples for an exchange of technology could be the replacement of horse power by electricity or, in the case of products, the replacement of rubber or steel by plastics.
- 3 However it is not trivial to identify possible discontinuities in the empirical data. A recent discussion about the state of the art and possibly arising problems can be found e. g. in Christiansen (2008).
- 4 Hence governmental demand is most important to spur innovation in the field of drastic innovations, while private demand may well suffice for incremental innovations. However, this paper refrains from dealing with a sophisticated discussion of the role of governmental demand.
- 5 In the following parts the abbreviation GPT stands for general purpose technology.

- 6 Note that other authors, e. g. Lipsey, Bekar, and Carlaw (1998) define general purpose technologies slightly different. For example these authors stress the importance that at their emergence general purpose technologies are characterized by a wide potential of improvement, hence inducing technological dynamics.
- 7 The emergence of electricity, e. g., made people independent from daylight. This had far reaching consequences for the organization of work life – and hence also affected the daily routines not only of firms but also of families.
- 8 Bresnahan and Trajtenberg (1995) call this ‘dual inducement hypothesis’.
- 9 See Bresnahan and Trajtenberg (1995) for a formal presentation of these interdependencies.
- 10 Note especially the literature in the context of so called basic innovations which induce long-run waves which sometimes are also called Kondratieff cycles; observe also the argumentation in Rosenberg (1996) or David (1990).
- 11 Observe that one could basically extend the analysis also with respect to the role of complementary investment of any kind.
- 12 This topic is discussed in detail within the literature on industrial organization. An overview can be found e. g. in Tirole (1990). The corresponding impact on aggregate growth is discussed e. g. by Aghion and Howitt (1998), Grossman and Helpman (1990) or Barro and Sala-i-Martin (2004).
- 13 Some typical examples for lead markets are the us for personal computers or drugs, Japan for fax and video, or Scandinavian countries for mobile telephones. Germany is a typical lead market in automobile or process technology. The latter includes mechanical engineering, measurement technology, environmental technology and technical components. The lead position is based on a strong industrial basis as well as mostly on the preferences of industrial customers.
- 14 For some technologies, e. g. telecommunication or the internet, network effects also gain importance. Then the level of individual utility increases with the number of people using the same technology.
- 15 Non-controversial technologies are solar energy, new propulsion technologies or medicine. Controversial technologies are biotechnology, nanotechnology or high-tech agriculture (see e. g. Werwatz et al. 2007).
- 16 Central features of the Eurobarometer include questions about health, culture, information technologies, environmental protection, the Euro or national defense. More information can be found at http://ec.europa.eu/public_opinion/index_en.htm.
- 17 A detailed discussion about financing details in the context of basic research and applied research can be found in Klodt (1995).

- 18 Examples for such institutions are CAN in Hamburg or MINATEC in Grenoble.
- 19 See e. g. Ott and Papilloud (2007) for an analysis of a regional institution's impact on the development of nanotechnologies.
- 20 The following countries are included: Sweden, Finland, Denmark, The Netherlands, USA, UK, Canada, Belgium, Japan, South Korea, Ireland, Spain, Germany, Switzerland, France, Italy and Austria. The indicators focus on questions with respect to: (i) openness towards technology and sciences, (ii) basic attitudes according to Inglehart (1997), (iii) risk attitude, (iv) trust in innovation actors, and (v) women's participation rate.
- 21 Observe that more knowledge and scientific understanding does not generally lead to higher acceptance of technologies and innovation. While knowledge increases acceptance of non-controversial technology, this result does not hold for controversial technologies. Evans and Durant (1995) show that more knowledge raises the acceptance gap between different technology fields. Hence increasing knowledge does not automatically spur acceptance rates of controversial technologies.
- 22 See Nordmann (2004, 19), and also Roco and Bainbridge (2002, 282). Defending a strict technological classification of the expression converging technology, Roco and Bainbridge (2002, 282) refer it to the combination of four major NBIC proveniences of science and technology, namely, (1) nanoscience and nanotechnology; (2) biotechnology and biomedicine, including genetic engineering; (3) information technology, including advanced computing and communications; and (4) cognitive science, including cognitive neuroscience. For a broader application of this expression, compare the description given by Wood, Jones, and Geldart (2003, 23): 'Many of the applications arising from nanotechnology may be the result of the convergence of several technologies.'

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A Model for Making Foreign Direct Investment Decisions Using Real Variables for Political and Economic Risk Analysis

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The Foreign Investment Risk Matrix (FIRM) developed by Bhalla (1983) uses political and economic risk measures for foreign direct investment decision making. FIRM may be used to develop a matrix that categorizes countries based on political risk and economic risk as acceptable, unacceptable, or uncertain for investment. We demonstrate using political and economic risk variables that are available on the internet in an expanded model using three measures of political risk and three measures of economic risk. After determining the group of countries that would be acceptable for FDI, the multinational companies can focus on further analysis of acceptable countries.

Key Words: political risk analysis, economic risk analysis, foreign direct investment, multinational corporation

JEL Classification: G2, F2

Introduction

In this paper, we show how a multinational firm can use readily available measures of political and economic risk to create a two-dimensional model for foreign direct investment (FDI) analysis. Bhalla (1983) describes a four-step process that can be used for political and economic risk analysis and step one is called the Foreign Investment Risk Matrix (FIRM). FIRM allows a multinational corporation to assess the political and economic risk of countries and allows the decision maker to classify countries into multiple risk groupings. In this paper, we demonstrate how to use an expanded version of Bhalla's model for a multinational corporation to execute country risk analysis in-house, which reduces the need to purchase political and economic risk information from either consultants or from analysis services and permits the multinational cor-

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poration decision maker to create a model for a specific company or FDI project.

Over the last two decades, the amount of direct foreign investment overseas has increased substantially. US direct investment abroad grew from \$208 billion in 1982 to \$1,789 billion (valued at historical cost) in 2003 which is an annual growth rate of 10.3% (Borga and Yorgason 2004). In 2003, US direct foreign investment was largest in the United Kingdom at \$273 billion or 15.2% of total US direct foreign investment, followed by investments in Canada and the Netherlands at \$192 billion and \$179 billion, respectively, which is 10.8% and 10.0% of the total US direct foreign investment (Borga and Yorgason 2004). While most US direct foreign investment is in countries in Europe and North America, the amount of investment in Africa and the Middle East grew by 16%, followed by Europe (14%), Canada (10%), Asia and the Pacific Region (7%), and Latin American and the Rest of the Western Hemisphere (7%). It is advantageous to be an early entrant in an emerging market for a multinational corporation. Early entry provides market power which yields monopolistic profits resulting from new sources of demand, acquisition of cheaper raw materials, and economies of scale.

From 2001 to 2002, US direct foreign investment in industrialized countries grew at a rate of about 8%. The largest growth, however, was in countries classified as emerging market countries. Growth in US direct foreign investment in Africa and the Middle East exceeded 10% in 2002 and 16% in 2003, although the absolute dollar amount invested still remains small (Borga and Yorgason 2002; 2004). These trends provide evidence for the need for multinational corporations to have access to a reliable model for predicting country risk as the risks of entering a new foreign market directly are not only higher, but are also difficult to forecast. Obtaining reliable and accurate forecasts of country risk is necessary for any multinational corporation (MNC) decision maker. Country risk relates to the likelihood that changes in a foreign business environment will occur and will reduce the profitability or riskiness of an overseas FDI. The two main components of country risk that investors need to consider are political risk and economic risk for a country. Butler and Joaquin (1998) define political risk 'as the risk that a sovereign host government will unexpectedly change the 'rules of the game' under which businesses operate.' The authors show how political risk can affect the future cash flows of a FDI and how political risk can be factored into the required rate of return. Political risk refers to the risk that the politics within a country will affect a multinational's FDI in that country.

Butler and Joaquin (1998) develop a model of political risk that shows how political risk impacts the cost of capital for an investment. In the Butler-Joaquin model, the impact of a political risk change on the cost of capital of the investment depends on the impact of the political risk change on the expected return of the investment and the covariance of the return on the investment and the return on the market. If the expected impact of the change in the political environment on expected future cash flows is negative and if the covariance between the expected future cash flows from the investment and the return on the market is negative (positive), the effect of a political risk change is to increase (decrease) the cost of capital for the investment. If the expected impact of a change in the political environment has a positive impact on expected future cash flows and the covariance between the cash flows from the investment and the return on the market is positive (negative), the effect of a political risk shock is to increase (decrease) the cost of capital for the investment. The impact of a political risk change is determined by the impact of the change on the expected rate of return and the covariance of the return on the investment and the return on the market.

Bhalla (1983) shows that a change in political risk can result from political changes due to elections, revolts, recessions, or wars, and the resultant change in political risk can lead to expropriation, higher taxes or tariffs, reduced FDI incentives, local ownership requirements, local content requirements, or currency inconvertibility. The net effect may be the loss of assets, the termination of operations, reduced after-tax income, higher import costs, reduced revenue, management restrictions, higher operational costs, or an inability to repatriate funds. Macro-economic mismanagement by the government can lead to higher inflation and higher interest rates leading to higher costs, planning difficulties, and higher interest costs. Other types of political difficulties such as labor unrest or strikes can lead to higher production costs and production interruptions.

MNCs need to determine future risks to an FDI from political risk and future risks from the country's economic environment, both of which affect the profitability and riskiness of FDI. Two types of economic factors affect MNC FDI: macro-economic factors and micro-economic factors. Macro-economic factors would include fluctuations in a country's inflation rate, exchange rate, tax rate, and interest rates, while micro-economic factors would include demand for a firm's products, the availability of local labor, local wage rates, and employment laws.

It is important that the MNC planning to invest overseas be able to analyze a country's political and economic risk. The MNC can purchase

country risk information from a consulting service and/or the MNC can create their own in-house analytical model. When MNCs purchase a consulting service, the model developed may not reflect the specific environment of the country and the specific FDI project since consulting services provide general ratings for country political and economic risk and may not provide specific industry, firm, or project information and details in the analysis. If MNCs create country political and economic risk analyses for specific FDI characteristics, they can tailor the FDI risk analysis with less uncertainty.

Literature Review

Erb, Harvey, and Viskanta (1996b) describe country risk analysis using five measures: political risk, economic risk, financial risk, a composite risk, and a country credit rating. The first four variables the authors use are taken from *Political Risk Services' International Country Risk Guide* (ICRG; see <http://www.prsgroup.com>) and the fifth variable is from *Institutional Investor* (see <http://www.institutionalinvestor.com>) The empirical results indicate that the country risk measures are correlated with each other, but the financial risk measures contain the most information about future stock returns, and political risk measures contain the least information about future stock returns. These findings support the use of political and economic risk analysis by investors interested in foreign stock market returns. But, MNCs considering FDI need to be able to forecast the effect of future political events and economic events for use in FDI decisions.

Erb, Harvey, and Viskanta (1996a) findings support the use of political and economic risk analysis using FIRM by multinational corporations. Multinational corporations considering direct foreign investments of the bricks and mortar type need to be able to forecast the effect of future political events as well as financial or economic events on their investments. Using FIRM will enable a corporation to assess this risk for a specific project while differentiating between a numbers of countries.

Using annual data for the period 1980 to 1997, Bekaert, Harvey and Lundblad (2001) find that emerging equity market liberalization leads to an increase in real economic growth. Bekaert, Harvey and Lumsdaine (2002) find that emerging equity market liberalization leads to increases in market integration that leads to an increase in real economic growth. The empirical breaks that the authors find do not correspond with announced liberalization dates, but reflect the date of actual liberalization

such as the announcement of the first ADR or the date when the first country fund is issued. Empirical liberalization effect dates generally occur after the official dates. The authors conclude that it is not enough for countries to change the rules to permit foreign investment to bring about market integration. Foreign investors must still be able and willing to invest in the country with liberalized stock markets.

Stoever (2002a) states that there are numerous stimuli for economic liberalization which will reduce political risk and shows the process by which economic liberalization leads to economic development. As the host country government liberalizes the political and economic environment, multinational corporations will be permitted an increased range of economic activity. Economic liberalization leads to reduced restrictions on the actions of multinational corporations, which reduces the costs and risks to multinational corporations making foreign direct investments. With reduced costs and reduced risks, the multinational corporation requires a reduced rate of return that, in turn, provides greater benefits to the host country since more of the excess cash flow is left in the host country. Any country evolving policies for foreign direct investment should avoid inconsistency, develop clear priorities, evolve policies over time, match the speed of deregulation with the rate of economic growth, keep actions and statements consistent, make reforms genuine, and avoid excess political influence in the liberalization process. Stoever (2002b) develops a measure of openness for Korea over the period from 1962 to 2000. Data are provided for both foreign direct investment into Korea and for Stoever's measure of openness. These results show a positive relationship between economic openness and foreign direct investment, that is, reduced political risk leads to increased foreign direct investment.

Roll and Talbott (2001) analyze the determinants of wealth over the period 1995 to 1999 for 162 countries. Roll and Talbott's empirical results indicate that variation in GNI per capita across countries can be explained by nine different measures of economic openness – property rights, political rights, civil liberties, press freedom, and government expenditures positively influence GNI per capita. GNI per capita is negatively related to excessive regulation, poor monetary policy, black market activity, and trade barriers. Roll and Talbott find that positive democratic events are followed by increases in growth in GNI per capita in those countries, while negative democratic events are followed by decreases in growth in GNI per capita in those countries.

Additional empirical findings support the hypothesis that there is a positive relationship between economic openness and economic growth and development. Demirguc-Kunt and Maksimovic (1998) and Wurgler (2000) analyze the relationship between the legal environment and economic development and show that increasing the level of legal protection increases economic growth. A positive relationship between financial liberalization and economic growth is reported in Beck, Levine, and Loayza (2000), Henry (2000), Jalilian and Kirkpatrick (2002), Jayaratne and Strahan (1996), Kassimatis (2002), King and Levine (1993), Levine and Zervos (1996; 1998) and Rajan and Zingales (1998). Barro (1991), Ryoo and Smith (2002) and Su and Fleisher (1998) show that government intervention, in the form of day trading limits, reduces market efficiency. Fischer and Sahay (2000) find that the former Communist countries economies that have performed the best are the countries that were most committed to political and economic reform.

Empirical research indicates that country credit ratings are useful to multinational corporations in evaluating the riskiness of foreign direct investment in a particular country. Measures of political openness are useful in evaluating the political environment of a particular country and measure the foreign direct investment environment. Published research of the World Bank indicates that gross national income per capita describes the economic environment and potential in countries and is highly correlated with other measures of economic development. These research results support the hypothesis that country risk can be measured by country credit ratings and that country risk levels are further related to political and economic risk variables.

Foreign Investment Risk Matrix

Bhalla (1983) provides a country risk analysis process to analyze a foreign direct investment by a multinational corporation using a four-step process. The first step is to create the foreign investment risk matrix to determine which countries provide a stable political environment and have the economic potential to give the country the potential to be acceptable for foreign direct investment. The second step is to create a country risk profile for each country selected in the first step that is a detailed analysis of the business environment in each country selected in step one. The third step creates a foreign investment risk analysis for each project for each country to determine if the proposed foreign direct investment is compatible with the economic and political environment assumed in

the country under analysis. The fourth step creates a foreign investment risk audit that allows the multinational corporation to monitor and re-evaluate the environment on a continuous basis to alert the multinational corporation to avoid surprises that may arise from changes in the economic and political situation in the country in the future.

Bhalla (1983) defines foreign investment risk management as the process of evaluating the political stability and the market potential of a particular country by a multinational corporation. Bhalla creates a two-dimensional matrix with four categorical variables for each dimension of political risk and economic risk called the foreign investment risk matrix (FIRM). Political risk is divided into four categories from A to D with A being stable, B being moderately unstable, C being volatily unstable, and D being substantially unstable. Economic risk is divided into four categories from one to four. Category one indicates acceptable risk, category two indicates moderate risk, category three indicates major risk, and category four indicates unacceptable risk. The specific political risk measures used by Bhalla are government stability, the method and frequency of changes in government, and the attitude of the public toward government leaders and institutions. The specific economic risk measures used by Bhalla are defined in terms of the market potential for the firm's products. The economic risk measures used are the demographic characteristics of the country, the infrastructure in the country, the economic breadth of income, the per capita GNP, and the economic growth potential.

Bhalla (1983) argues that income per capita and the distribution of income per capita are the most important variables in determining both economic and political risk because income per capita reflects both the underlying economy and the effectiveness of the political management. Both the level of income per capita and the distribution of income per capita effect economic and political risk. More evenly distributed income per capita reduces both economic and political risk.

The four different categories of income are graphed on the FIRM. Countries will have substantial political instability if they have low income per capita with poor income distribution and a narrow economic base. Countries have stable political risk if they have high income per capita, even income distribution, and a broad economic base. Countries with populations less than 5 million or income per capita of less than \$500 were excluded from consideration because these countries lacked sufficient market size for the product being considered. The four polit-

ical risk rankings are influenced by population size, income per capita growth rates and economic diversity. Economic risk is divided into four categories from acceptable to unacceptable, based on demographics, infrastructure, economic diversity, demand characteristics, and economic growth.

The FIRM is a graphic representation of these two dimensions. Four categories of political risk by four categories of economic risk yield sixteen different categories of countries. Countries that have political stability and have acceptable economic risk would be in the upper left-hand cell. Countries with substantial political instability and unacceptable economic risk would be in the lower right-hand cell.

A multinational corporation would choose from the countries in the cells that meet the first round of criteria. This first pass will substantially reduce the number of countries under consideration. Stage two of the political risk analysis process is the country risk profile. The country risk profile is more detailed and is based on three sets of criteria: political stability, social stability, and economic stability. A multinational corporation analyzes these variables to determine if any internal or external problems exist that could substantially alter the FIRM created in the first step. The country risk profile allows the multinational corporation to eliminate any country that appears to have potential future economic or political problems.

The investment risk analysis is conducted as stage three, in order to ensure that the project can be structured to survive future risks such as political risk, social risk, and economic risk. Political risk variables would include political instability, expropriation, or acts of terrorism. Social risk variables would include labor unrest. Economic risk variables would include price controls, recession, inflation, devaluation, or foreign exchange controls.

The fourth stage of analysis is the foreign investment risk audit. The foreign investment risk audit is an ongoing process designed to allow the multinational corporation to anticipate changes in the environment that will affect the viability of the foreign direct investment project. The foreign investment risk audit allows the multinational corporation to develop appropriate strategies for adapting to changes in the environment or to appropriate exit strategies. The foreign investment risk audit allows the multinational corporation to develop an information data base of variables that will allow the multinational corporation to monitor and adapt the foreign direct investment project to future changes in the political and economic environment.

Madura (2000) presents the FIRM in a continuous, variable framework instead of using discrete categories. The Madura model uses a continuous variable framework instead of providing only sixteen categories in a four – by – four categorical matrix. Both economic risk ratings and political risk ratings are continuous and described from low risk to high risk allowing the multinational corporation decision maker to differentiate countries in a continuous framework. The Madura model provides three categories: countries that have acceptable risk levels, countries that have unacceptable risk levels, and countries with unclear (uncertain) risk levels. Countries in the uncertain area would need further analysis for an acceptable or unacceptable decision to be made. McGowan and Moeller (2003) demonstrate how to determine the empirical boundaries in the political risk and economic risk space using multiple discriminant analysis. The authors use GNI per capita and the Index of Economic Freedom to categorize countries as either acceptable for FDI, unacceptable for FDI, or uncertain for 128 countries. McGowan and Moeller (2005) create a similar model using the same variables but with multinomial logistic regression.

In this paper, we demonstrate how to conduct country risk analysis using readily available measures that can be easily found using the internet. We extend Bhalla's model from a categorical model to a continuous format model using three variables to measure the political risk dimension and three variables to measure the economic risk dimension. We select this set of input variables because these variables are available from internet websites that are easy to use and free. We develop the model using three measures of political risk (the attitude of the host government toward FDI, conflict, and perceived corruption) and three measures of economic risk (GNI per capita, FDI potential, and the inflation rate). Both the variables and the weights are selected to demonstrate how to use the model and should be modified by the MNC making the FDI decision to fit the specific project, country, and MNC. These measures are used to differentiate countries that are acceptable for foreign direct investment from countries that are uncertain or unacceptable for foreign direct investment.

Input Variables

We select three variables to measure the political risk component: the attitude of the government toward FDI, the degree of conflict for the country, and perceived corruption within the country. We select three variables to measure the economic risk component: gross national in-

come per capita, inward FDI potential, and the inflation rate. Each of the three variables measures a different aspect of the risk component. We use three variables to demonstrate the model, even though a MNC could apply the model with only one variable or as many variables as needed by the MNC to meet its goals. The specific variables are chosen because the variables represent political and economic risk; even though alternative variables may be available, these six variables are available for free online. We try to provide example variables that are reasonable and readily available.

The Attitude of Government toward FDI is measured using the Index of Economic Freedom sub-index for Capital Flows and Foreign Investment. Beach and Driscoll (2002) provide a detailed discussion of how the factors of the Index of Economic Freedom are constructed. Restrictions on capital flows and FDI are measured by FDI codes, restrictions on foreign ownership of business, restrictions on the industries and companies open to foreign investors, restrictions and performance requirements on foreign companies, foreign ownership of land, equal treatment under the law for both foreign and domestic companies, restrictions on the repatriation of earnings, and availability of local financing for foreign companies.

The degree of conflict is measured using the *Conflict Barometer* which is published by the Heidelberg Institute of International Conflict and is available on the Institute's web site (<http://hiik.de>). Conflict is defined as 'the clashing of interests on national values of some duration and magnitude between at least two parties that are determined to pursue their interests and win their case.' The Conflict Barometer has five levels ranging in value from one to five. Level 1 is latent conflict and non-violent and low intensity. 'A positional difference on definable values of national meaning is considered to be a latent conflict if respective demands are articulated by one of the parties and perceived by the other as such.' Level two is a manifest conflict which is non-violent and low intensity. 'A manifest conflict includes the use of measures that are located in the forefield of violent force. This concerns for example verbal pressure, threatening publicly with violence, or the imposition of economic sanctions.' Level three is defined as crisis and is violent and of medium intensity. 'A crisis is a tense situation in which at least one of the parties uses violent force in single incidents.' Level 4 is defined as severe crisis and is high intensity. 'A conflict is considered to be a severe crisis if violent force is repeatedly used in an organized way.' Level 5 is defined as war and is violent and is

high intensity. 'Wars are a type of violent conflicts in which violent force is used with a certain continuity in an organized and systematic way. The conflict parties apply extensive measures, according to the situation. The amount of destruction is vast and of long duration.'

Perceived corruption is measured using the Corruptions Perceptions Index. The CPI is published by Transparency International on a yearly basis. The index is a weighted average of a number of indexes and surveys of perceived corruption. Political corruption is defined as 'the abuse of power by political leaders for private gain, with the objective of increasing power or wealth.'

Gross national income per capita data are taken from *World Development Indicators 2001* which is published by the World Bank and are available on the web site (<http://web.worldbank.org>). Estimation of Internationally Comparable Per Capita Income Numbers for Operational Purposes published by the World Bank (see <http://go.worldbank.org/v4HS8ZBUDO>) indicates that GNI per capita is not a complete measure of economic growth and development, but most other measures of economic growth and development are highly correlated with GNI per capita.

FDI Potential is measured using UNCTAD's Inward FDI Potential Index which is an equally weighted average of the values (normalized to yield a score between zero, for the lowest scoring country, to one, for the highest) of 12 variables: GDP per capita, the growth rate of GDP for ten years, exports to GDP, the average number of telephone lines per 1000 inhabitants, commercial energy use per capita, R&D spending to GDP, the proportion of tertiary students in the population, country risk, the world market share in exports of natural resources, the world market share of imports of parts and components for automobiles and electronic products, the world market share of exports of services, the share of world FDI inward stock.

The Inflation Rate is measured using the Index of Economic Freedom sub-index for Monetary Policy. The Monetary policy index is based on the inflation rate for the previous ten years in the country.

The Attitude of the Host Government and the Inflation Rate are the IEF sub-indexes subtracted from five since the IEF indexes are highest at one and lowest at five. The Conflict Barometer value is taken directly since the conflict barometer is valued from zero to five. The CPI is transformed by dividing the published value by two. The GNI per capita variable is assigned a five for a high income economy, one for a low income

TABLE 1 United Kingdom

Political risk factors	Rating	Weight	R×W
Attitude of host government	3.00	35%	1.05
Conflict	2.00	35%	0.70
Corruption	4.35	30%	1.31
Total		100%	3.06
Economic risk factors	Rating	Weight	R×W
GNI per capita	5.00	30%	1.50
FDI Potential	4.67	35%	1.63
Inflation rates	3.00	35%	1.05
Total		100%	4.18
Total risk factor	Weight	Value	W×V
Political risk	60%	3.06	1.83
Economic risk	40%	4.18	1.67
Total			3.51

NOTES Political risk variables are measured accordingly; (1) the attitude of the government toward FDI is measured by the Index of Economic Freedom Sub-index for Capital Flows and Foreign Investment, (2) the degree of conflict for the country is measured by the Conflict Barometer published by the Heidelberg Institute, (3) the perceived corruption within the country is measured by the Corruption Perceptions Index published by Transparency International.

Economic risk measures are measured accordingly; (1) gross national income per capita data are taken from the World Development Indicators published by the World Bank, (2) inward FDI potential is measured by the Inward FDI Potential Index published by UNCTAD, (3) the inflation rate is measured by the Index of Economic Freedom Sub-index for Monetary policy.

The weights from each index would be determined by the MNC decision maker based on the relative importance of each variable. In the paper, we randomly selected weights.

economy, four for a high middle income economy, two for a low middle income economy, and one for a low income economy. The FDI Potential Index is scaled from zero to one and is transformed by multiplying the published values by ten and dividing by two.

The Model Applied to Four Countries

Tables 1, 2, 3, and 4 show the values computed for each of the six input variables for the United Kingdom, Brazil, Poland, and Russia. For the UK, the scores for Attitude of the Host Government, Conflict, and Corruption are 3.00, 2.00, and 4.35, respectively. The values for GDI per capita,

TABLE 2 Russia

Political risk factors	Rating	Weight	R×W
Attitude of host government	2.00	35%	0.70
Conflict	1.00	35%	0.35
Corruption	1.35	30%	0.41
Total		100%	1.46
Economic risk factors	Rating	Weight	R×W
GNI per capita	2.00	30%	0.60
FDI Potential	2.91	35%	1.02
Inflation rates	2.00	35%	0.70
Total		100%	2.32
Total risk factor	Weight	Value	w×v
Political risk	60%	1.46	0.87
Economic risk	40%	2.32	0.93
Total			1.80

TABLE 3 Brazil

Political risk factors	Rating	Weight	R×W
Attitude of host government	2.00	35%	0.70
Conflict	5.00	35%	1.75
Corruption	1.95	30%	0.59
Total		100%	3.04
Economic risk factors	Rating	Weight	R×W
GNI per capita	4.00	30%	1.20
FDI Potential	1.84	35%	0.64
Inflation rates	3.00	35%	1.05
Total		100%	2.89
Total risk factor	Weight	Value	w×v
Political risk	60%	3.04	1.82
Economic risk	40%	2.89	1.16
Total			2.98

NOTES For explanation, see table 1

FDI Potential, and Inflation are 5.00, 4.67, and 3.00, respectively. In this paper, as a demonstration, the weights are arbitrary. The weights used in the computation of the political risk factor and of the economic risk

TABLE 4 Poland

Political risk factors	Rating	Weight	R×W
Attitude of host government	2.00	35%	0.70
Conflict	5.00	35%	1.75
Corruption	1.80	30%	0.54
Total		100%	2.99
Economic risk factors	Rating	Weight	R×W
GNI per capita	4.00	30%	1.20
FDI Potential	2.56	35%	0.90
Inflation rates	2.00	35%	0.70
Total		100%	2.80
Total risk factor	Weight	Value	W×V
Political risk	60%	2.99	1.79
Economic risk	40%	2.80	1.12
Total			2.91

NOTES For explanation, see table 1.

factor would be determined by the corporate decision maker based on the importance of the individual variables to the specific company and project. An overall total risk factor can be calculated by taking a weighted average of the political risk factor and the economic risk factor. Again, the weights are based on the judgment of the corporate decision maker. The political risk factor for the United Kingdom is 3.06 and the economic risk factor value is 4.18. In this case, the United Kingdom plots in the region defined as acceptable for FDI. The values for Brazil and Poland both plot in the uncertain region, and the values for Russia plot in the unacceptable for FDI region.

The model used in this paper is an extension of the Bhalla (1983) and Madura (2000) models. A two dimensional grid is created where one dimension is economic risk and the other dimension is political risk. Both dimensions are scaled from one to five, alternatively the scales could have been from one to one hundred. In either case, the scale for all of the variables must be transformed to be the same. For a country to be acceptable for FDI, the country must have values for political and economic risk that plot in the area segmented by the minimum acceptable level of both dimensions, both political risk and economic risk. Thus, in figure 1, countries that plot in the upper right hand corner are acceptable for FDI,

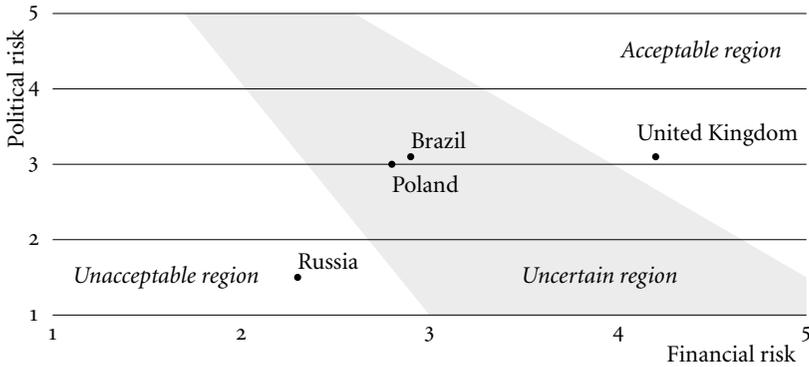


FIGURE 1 The Foreign Investment Risk Matrix is a graphical representation of the values computed in tables 1 to 4. The UK is in the upper right corner that represents the area of acceptable countries. Russia is in the lower left corner that represents the area of unacceptable countries. Brazil and Poland are in the uncertain area where countries might be acceptable or not depending on further analysis.

and countries that plot in the lower left hand corner are unacceptable for FDI. Countries that plot in the areas between the acceptable region and the unacceptable region, are uncertain, that is, these countries require further analysis for a final decision.

To demonstrate the use of the FIRM, we calculate values for both political risk and economic risk for four countries: Brazil, Russia, Poland, and the UK. These four countries are selected for illustration purposes only since this set of countries provides plots in each of the three regions. We estimate the political risk dimension with three variables: the attitude of the host government toward FDI, the level of conflict in the country, and the perceived corruption level in the country. We estimate the economic risk dimension with three variables: GNI per capita, the FDI Potential Index, and the inflation index. Each variable is measured using a published index that is available on the internet. Thus, an MNC can use the model provided in this paper to facilitate the FDI decision by allowing the decision maker to eliminate from detailed analysis countries that do not meet minimum specified levels of political and economic risk.

Summary and Conclusions

Foreign direct investment has become increasingly important for multinational corporations. The level of foreign direct investment by US multinational corporations outside of the United States and by non-US

multinational corporations into the United States has increased dramatically over the last twenty years. The need for political and economic risk analysis has increased with foreign direct investment by multinational corporations. Even as some countries and regions of the world have steadily reduced barriers to and restrictions on foreign direct investment, other countries and regions of the world have become increasingly hostile to foreign direct investment. Although political risk assessment services are available, these services provide general ratings rather than ratings specific to the actual project being considered by the multinational corporation.

Political risk is the result of changes in the environmental circumstances for the multinational corporation. Although political risk generally results from governmental action, social factors can cause the environment to change. In either case, less political risk is desirable for the multinational corporation. Economic risk changes can result from changes in either the macro-economic or micro-economic environment. Multinational corporations need to be able to determine which countries provide the best economic conditions for the production and sale of the multinational corporation's products or services.

The Foreign Investment Risk Matrix provides a framework with which an MNC can analyze the combination of both political risk and economic risk for making FID decision. The FIRM uses values that are defined by the MNC for their impact on the specific FDI project that can be collected directly from the internet by the multinational corporation to evaluate the political risk and economic risk for a specific country related to the specific project under review. The six independent variables used in this paper can be applied to the FIRM to allow the multinational corporation to divide countries under consideration into countries that are acceptable for foreign direct investment, countries that are unacceptable for foreign direct investment, and countries that provide uncertain environments and need further study before an accept/reject decision can be made. Overall, the FIRM process allows the multinational corporation to focus attention on investment environments with higher likelihood of success. That is, the MNC decision maker can eliminate countries from further analysis that do not meet specified minimum levels of political and economic risk. The model, as shown in this paper, can be tailored to meet the specific needs of the MNC to evaluate a specific project in a specific country.

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The Influence of Outsourcing and Information and Communication Technology on Virtualization of the Company

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In the article we investigate the field of virtual organizations, which in the definition of many authors consists of two components: outsourcing and information and communication technology. In the study we have tried to determine which of the two, in the opinion of employees working in the area of Slovene tourism, contributes to a greater degree to virtualization of the company. We determine that outsourcing influences the virtualization of the company more strongly than does information and communication technology, since it enables the company to acquire new knowledge and know-how and increase its competitiveness in the marketplace.

Key Words: virtual organization, outsourcing, information and communication technology

JEL Classification: L22, D23

Introduction

The development of information technology and telecommunications is changing the modern economic and social system. Economic subjects are particularly confronted with an external environment that is constantly changing, one which is characterized by an increasing complexity. The clear and structured economic scenario of the 1980s has been cast off in a context in uncertainty, constant changes and, consequently, difficulties in general are forcing companies to adapt their competitive approach and to develop new capabilities. The globalization of the marketplace and the rapid spread of new technologies linked with the world of information science and telecommunications have profoundly marked the operating of the economic systems in every country. Rapid and significant technological changes have led to decisive shifts in production

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techniques and the administering of technological, financial and human resources, which has reinforced the high speed of transfer of innovative processes, and has reformed consumption as well as the channels through which information flows and is transmitted. Collectively, these elements have profound economic implications for everyone involved in the production and broader societal system (Ye, Xu, and Chen 2002; Bavec 2002; Bauer and Köszgi 2003; Cooper and Rousseau 1999; Jansen, Steenbakkens, and Jägers 1999).

As a response to such changes there has been a change in the organization of processes within companies, and this had led to the phenomenon of the virtual organization. Such an organization is characterized by the use of both information and computer technology and outsourcing.²³ The degree to which one or the other is used varies. Companies use one or the other, or even both simultaneously. As the research shows, the use of both outsourcing and computer and information technology has increased greatly (Sigala 2003; Sourenkova and Louvieris 2005; Lamminmaki 2005). This study focuses on the tourist sector of the economy, and aims to determine which of the two factor has a greater influence on the degree of virtualization of a company. Directors of selected companies from the area of tourism participated in the study. They were asked to indicate the degree to which each factor contributes to the virtualization of the company. Our conclusions are derived from a number of perspectives related to each factor, including: competitiveness and competitive advantage of a company, focussing on key competencies, knowledge and know-how, more efficient use of sources, improved service and greater customer satisfaction, and also fear of unemployment.

The article is structured into four main sections. In the introduction, we present the area of research, the research problem, the purpose and aims of the study. This is followed by the theoretical and empirical parts, and then the conclusion. In the theoretical part we provide an overview of the various definitions of virtual organization within the literature, as well as a synthesis of various researchers' viewpoints on the phenomenon of virtual organization. The empirical section begins by providing a description of the methodology and the sample, before moving to an analysis of the study results. In the conclusion we summarize the most important outcomes of the study.

Definition of Virtual Organization

The term virtual organization was coined in the late 1990's to denote a new way of aligning business practices, core competencies, and product

and service delivery such that they would allow for a more effective way to satisfy consumer demands (Southard 1998).

There are three generic types of accounts regarding virtual organizations in the literature (Burn, Marshall, and Barnett 2002; Shao, Lee, and Liao 2000; Shao and Liao 1996). The first regards organizations that outsource some of their business activities, forming virtual alliances to achieve organizational objectives. Virtual organizations may be formed by integrating several companies' core competencies and resources. A virtual company, thus, is a collection of several companies organized to behave as if it were a larger, multifaceted organization. Research reveals that there exist various definitions of this type of virtual organization.

Donlon (Southard 1998) defines a virtual organization as '... one that focuses on its core competencies and engages in strategic sourcing and partnership development to support its non-core activities.'

Strausak (1998) defines a virtual organization as a form of cooperation involving legally autonomous companies, institutions and/or individuals delivering a product or service on the basis of a common business understanding. The cooperating units participate in the collaboration primarily with their core competencies and present themselves to third parties as a unified organization when delivering the product or service.

Robbins (2005) defines a virtual organization as, typically, a small, core organization that outsources one or more of its primary business functions. In structural terms, the virtual organization is highly centralized, with little or no departmentalization.

The most resounding view of virtualization that remains completely neutral in terms of technology has been developed by Mowshowitz (1999; 2002), who introduced the concept of the 'switching principle.'

He describes a virtually organized task as a goal-oriented activity that is implemented by an appropriate assignment or reassignment of concrete satisfiers to the abstract requirement of the task. Switching depends on the categorical separation of requirements from satisfiers. At any given moment there is an allocation of satisfiers to requirements, though the particular allocation can change over time.

The second type of descriptions pertains to organizations that are built up by means of virtual links with information technology. Earlier work in the area of ICT and organizations points in the general direction that ICT contributes to organizational structures and provides an increasingly virtual mechanism for realizing organizational objectives.

Chaffey (2002) defines a virtual organization as an organization which

uses ICT to allow it to operate without clearly defined physical boundaries between different functions. Buchanan and Huczynski (2004) define a virtual organization as an organization where a large number of the organization members use electronic channels as their main (or even only) medium of contact with each other, as well as with the rest of the organization.

According to Collins (2003), a virtual organization can be broadly defined as an organization that forms, and/or maintains, some or all of its internal or external relationships electronically. Its work products are of an electronic rather than a paper nature. This broad definition of virtual organization includes organizations whose relationships with clients, customers, vendors, consultants, or joint venture partners are maintained virtually.

Fulop and Rifkin (2004) define a virtual organization as an organization that is usually highly flexible and often relies on internet businesses or the use of technology in order to limit the importance of physical space and location in favour of cyberspace.

The third approach to virtual organization is perhaps the most complicated. This approach is an amalgam of the two approaches previously mentioned, in which authors move almost interchangeably between the virtual organization as an electronic or online organization, and the virtual organization as a somewhat transient network of people, ideas, competencies and resources which come together for a particular purpose. The framework of understanding virtual organization is, in this case, often subjective and open to myriad interpretations. These interpretations hinge on the particular manner in which the individual perceives organization.

An overview of the literature shows that there are three fundamental standpoints on the concept of virtual organization. Two have a relatively uniform view of virtual companies, whereas the third allows for various viewpoints. Characteristic of this last viewpoint is that the authors consider it to be a *mélange* of the other two viewpoints. They are not in accord about which of the two factors, outsourcing or ICT, is more typical of virtual organization; they are open to various views and interpretations. The authors of this article also believe that both factors are necessary to the virtual company, and it is for this reason that we chose to examine the influence of both factors on the virtualization of a company. We are convinced that both are of paramount importance for the transition from classical to virtual organization.

The Methodology

In accordance with the third approach, we defined the virtual organization as an organization that outsources its non-core competence activities and maintains some or all of its internal and external relationships electronically. The main purpose of our study was to discern whether or not the two components – outsourcing and ICT – are equally important for the virtualization of companies in the tourism industry.

To do this, we developed a three-part questionnaire. The first part pertained to the general characteristics of the respondents (sex, type of organization, level and field of education . . .). The central part of the questionnaire contained 47 items that, on a five-point Likert-type scale, measured the degree to which the respondents agreed with several features of outsourcing or ICT and their importance for the (virtual) organization. The items were defined according to various aspects of outsourcing and ICT found in past theoretical discussions and empirical research (Benson and Ieronimo 1996; Buhalis 1998; Gautreau 2005; Lynch 2004; Lankford and Parsa 1999; Ellram and Billington 2001, Wilding and Rein 2004; Lewis, Semein and Talalayevsky 1998), which can be summarized as:

- Outsourcing/ICT can contribute to the competitiveness and competitive advantage of a company.
- Outsourcing/ICT can help a company to focus on its core-competencies.
- Outsourcing/ICT can help in the acquisition of new knowledge and know-how.
- Business process re-engineering experienced due to implementation of outsourcing/ICT can result in more efficient and cost-effective use of resources.
- Outsourcing/ICT improves the quality of service and contributes to greater customer satisfaction.
- Implementation of outsourcing/ICT is usually accompanied by employees' fear of being made redundant.

The last part of the questionnaire contained our definition of virtual organization, which was based on the two components already described (outsourcing and ICT). The respondents had to weight the degree to which each component is important for the virtualization of the company – that is to say, they had to assign a value from one to five denoting the level of importance of the given component.

TABLE 1 Respondents by field of education

Field of education	Number	Percentage
Education	1	1.4
Humanities	1	1.4
Social sciences, business and law	36	50.0
Science	9	12.5
Engineering, manufacturing and construction	8	11.1
Agriculture	1	1.4
Health and welfare	3	4.2
Tourism	13	18.1
Total	72	100.0

The Sample

Four firms in the tourism industry, selected on the basis of their position in the marketplace and on the basis of their profiles, were involved in the study – namely 1 hotel and 1 spa (H55.100 according to the National Standard Industrial Classification of all Economic Activities), 1 casino (O92.712 according to the National Standard Industrial Classification of all Economic Activities) and 1 travel agent (I63.300 according to the National Standard Industrial Classification of all Economic Activities). The subsequent state of the survey included all executives, managers, consultants and skilled employees from these firms.

Altogether, 72 questionnaires were returned, making for a response rate of around 40%. There were 64% men and 36% women included in the study. The majority of respondents (90.3%) had finished the first stage of tertiary education (level 5 according to ISCED97), 6 of them (8.3%) had finished the second stage of tertiary education (ISCED97 level 6) and 1 of them had finished only lower secondary education.

Most of them (50%) had finished a study program in the field of social sciences, business or law (field 4 according to ISCED97).

They were, on average, 36.6 years old with an average work experience of 12.8 years.

Results

We began the analysis of the data compiled with the final survey question, which asked respondents to indicate the importance of outsourcing versus ICT for virtualization of the company. The average weight for out-

TABLE 2 Three categories of respondents

Category	Number	Percentage
Group 1: Outsourcing contributes more to virtualization	41	66.1
Group 2: ICT contributes more to virtualization	7	11.3
Group 3: Both components are equally important	14	22.6
Total	62	100.0

sourcing was 61.8% and 38.2% for ICT, which indicates that, on average, outsourcing contributes more to virtualization of a firm than does ICT. However, we can see rather large discrepancies among respondents. The lowest identified weight for outsourcing was 30% (70% for ICT) and the highest 90% (10% for ICT). The idea was to categorize all respondents into three groups: those who think outsourcing contributes more to virtualization (weight for outsourcing is larger than 50%), those who think ICT contributes more (weight for outsourcing is lower than 50%) and the group which thinks both components are equally important (both weights are equal to 50%). We can see that the majority of them considered that outsourcing contributes more to virtualization of a firm (see table 2), as just 7 of them thought that ICT is more important for virtualization. Ten of them did not answer the question. In the next stage, we tried to find significant characteristics for each category of respondents.

First, we tested whether education, age, work experience and job-type had a significant impact on how respondents regarded the relative importance of outsourcing versus ICT for the virtualization. We performed the contingency analysis²⁴ and found that the education level, age, work experience and type of job were not significantly correlated with the category of each respondent. On the other hand, the estimated contingency coefficient 0.58 and the value of Chi-square test statistics equal to 31.8 indicated a significant correlation between the three categories of respondents and their field of education (see table 3).

Most of the respondents who considered outsourcing to be more important for virtualization had finished studies in social sciences, business and law or tourism. For the most part, those educated in the fields of science or engineering, manufacturing, or construction fell within the group of respondents who considered ICT more important for the virtualization. In the group of those surveyed that does not give preference to either outsourcing or information and communication technology, the representation in terms of the area of education is more or less uniform:

TABLE 3 Categories of respondents by field of education

Field of education	(1)	(2)	(3)	(4)
Humanities	0	0	1	1
Social sciences, business and law	27	0	4	31
Science	1	3	5	9
Engineering, manufacturing and construction	2	3	2	7
Health and welfare	2	0	0	2
Tourism	9	1	2	12
Total	41	7	14	62

NOTES Column headings are as follows: (1) group 1 (outsourcing > 50%), (2) group 2 (ICT > 50%), (3) group 3 (50%–50%), (4) total. 14 cells (77.8%) have an expected count of less than 5. The minimum expected count is 0.11.

Contingency analysis	Value	df	Asymp. Sig. (2-sided)	Approx. Sig.
Pearson Chi-Square	31.830(a)	10	.000	
Contingency Coefficient	.582			.000

half come from the area of sociology, business, law and tourism, and half from the area of science or engineering.

Second, we attempted to analyze how the respondents' attitude to outsourcing and ICT determines the three categories of respondents. Since the central part of the questionnaire contained 47 specific items that, on a five-point Likert-type scale, measured the degree to which the respondents agreed with several features of outsourcing or ICT and their importance for the (virtual) organization, it would be quite difficult to evaluate all of them separately. Instead, we attempted to describe their attitude by means of more general evaluative dimensions. We performed two separate factor analyses, one based on items related to outsourcing features and the other based on items related to ICT features.

The estimation of factor matrices commenced with all items included in the analysis. However, some items were omitted, based on a low measure of sampling adequacy value and low communalities.²⁵ After several steps of respecification and evaluation, we agreed on the models shown in tables 4 and 5. The final step was the computation of coefficient Alpha (Cronbach 1951) for each of the dimensions to ascertain internal consistency for each dimension. As we can see, almost all coefficients exceed the value of 0.7 – the generally agreed lower limit of coefficient Alpha (Robinson, Shaver, and Wrightman 1991).

TABLE 4 Employees' attitude to outsourcing

Questionnaire item	(1)	(2)	(3)
24. Outsourcing is a consequence of demands for higher share profitability.	0.67		
4. Outsourcing allows a company to control expenses.	0.63		
6. Outsourcing allows a company to be more flexible.	0.62		
20. Outsourcing reduces business risks.	0.57		
10. Outsourcing allows a company to thoroughly transform itself.	0.56		
23. Outsourcing is a consequence of globalization.	0.55		
27. Outsourcing allows a company to become more productive.	0.51		
3. Outsourcing allows a company to save on expenses.	0.49		
1. Outsourcing allows a company to achieve a competitive advantage.	0.47		
15. Outsourcing means fragmenting a company.		0.75	
25. It is important for a company that all its activities are carried out in-house.		0.74	
16. Outsourcing means losing a company's identity.		0.73	
22. Outsourcing is unnecessary.		0.62	
21. All activities of a company can be successfully carried out in-house.		0.57	
19. Outsourcing means redundancies.		0.53	
11. Outsourcing allows a company to concentrate on key activities.		-0.50	
26. Outsourcing grants a company access to specialists.		-0.45	
28. Higher standards of quality can be guaranteed for the activities carried out within a company.		0.42	
18. Contractors cannot be trusted.		0.39	

Continued on the following page

According to the factor matrix in table 4, the attitude of employees to outsourcing can be explained through 3 general dimensions or aspects (factors):

- A competition aspect – how can outsourcing contribute to the competitiveness of a firm?
- An organizational aspect – what consequences does outsourcing have for the organizational structure?
- A knowledge aspect – how can outsourcing help a firm to acquire new knowledge and ideas for promoting development?

TABLE 5 *Continued from the previous page*

Questionnaire item	(1)	(2)	(3)
13. Outsourcing allows a company to acquire new ideas.			0.86
17. Outsourcing allows an increase in the quality of products/services.			0.79
12. Outsourcing allows a company to acquire new knowledge.			0.73
7. Outsourcing allows a company to be more effective.			0.53
9. Outsourcing is required when a company has a low level of innovation.			0.46
2. Outsourcing allows a company to survive in the market.			0.40
Cronbach Alfa	0.82	0.68	0.79

NOTES Column headings are as follows: (1) competition aspect, (2) organizational aspect, (3) knowledge aspect. Factors were extracted by means of the principal axis factoring method. The 'Direct Oblimin' factor rotation (oblique rotation) was used to simplify the factor solution. Only factor loadings higher than 0.4 (lower than -0.4) are shown in the factor matrix.

When discussing their attitude toward ICT, two aspects are evident from the factor matrix in table 5:

- An economic aspect – how can ICT contribute to the overall efficiency and cost-effectiveness of a firm?
- A communicational aspect – how important it is to implement ICT in most parts of business activities?

In the last stage, factor scores were estimated for each of the five factors, and analysis of variance was used to test whether identified factors (several aspects of outsourcing and ICT) differ among different groups of employees. The average scores for each factor and category of employees are shown in table 6. The competition and knowledge aspects referring to outsourcing were the only dimensions showing significant differences between categories. Interestingly, the aspect referring to ICT did not differentiate significantly between categories.

Competition and knowledge aspect, both referring to outsourcing, are most clearly present in the group of employees that considered outsourcing contributes relatively more to virtualization of the company, and least present in the group of employees that considered ICT to be a major determinant of virtualization. Thus, the employees who agreed with the statement that outsourcing contributes to a firm's competitiveness – and helps it to acquire new knowledge and ideas to promote development – considered outsourcing to be relatively more important for

TABLE 6 Employees' attitude to ICT

Questionnaire item	(1)	(2)
4. ICT allows a company to save on time.	0.88	
5. ICT allows a company to be more flexible.	0.80	
3. ICT allows a company to save on expenses.	0.80	
8. ICT is a great advantage in everyday tasks.	0.78	
7. ICT is unnecessary.	-0.78	
1. ICT allows a company to achieve a competitive advantage.	0.75	
6. The introduction of ICT leads to a higher level of efficiency.	0.68	
15. The appearance of a webpage reflects the organization and reputation of a company.	0.66	
12. A well-designed webpage can contribute to achieving better business results.	0.60	
2. ICT allows a company to survive in the market.	0.59	
18. Personal contact is very important in an industry such as tourism, which limits the use of ICT in the guest-institution relationship.	0.43	
10. It is recommendable that all communication be carried out with the help of information technology.		0.83
17. In order to avoid mistakes, any communication between a company and a guest should be carried out through ICT until the guest arrives.		0.75
16. It is important that all guests use the on-line reservations system.		0.51
11. It is important that all orders be carried out with the help of information technology.		0.50
Cronbach Alpha	0.81	0.73

NOTES Column headings are as follows: (1) economical aspect, (2) communicational aspect. Factors were extracted by means of the principal axis factoring method. The 'Direct Oblimin' factor rotation (oblique rotation) was used to simplify the factor solution. Only factor loadings higher than 0.4 (lower than -0.4) are shown in the factor matrix.

virtualization, whereas those who disagreed with these statements considered ICT to be relatively more important.

We can actually confirm on the basis of the results that in the group which places more noticeable emphasis on information and communication technology as a factor of virtualization, there is no perceptible presence of views showing their agreement with the positive contribution of information and communication technology on the virtualization of the company. The results show that in this group there is not a statistically significant difference between the individual viewpoints. In effect, it is more a matter of this group not agreeing with the positive

TABLE 7 A average factor scores by category of employees

Category	Outsourcing			ICT	
	(1)	(2)	(3)	(4)	(5)
Group 1: Outsourcing contributes more to virtualization	0.20	-0.11	0.22	0.07	-0.02
Group 2: ICT contributes more to virtualization	-1.03	0.02	-0.75	-0.05	0.10
Group 3: Both components are equally important	-0.23	0.08	-0.03	0.13	-0.20

NOTES Column headings are as follows: (1) competitiveness aspect, (2) organizational aspect, (3) knowledge aspect, (4) economical aspect, (5) communicational aspect.

contribution of outsourcing. We can thus conclude that those who do not accept outsourcing as a beneficial factor believe that information and communication technology is a more important factor of virtualization than is outsourcing.

The study focused solely on companies from the area of the Slovene tourist industry, which, of course, somewhat limits the research. There is room for further studies to expand the focus to other business areas. For example, it would surely be valuable to carry out a comparative analysis among companies from various economic sectors, as that would determine the various degrees of virtualization within individual sectors. On the basis of our study, it would also be possible for future researchers to examine the role that various types of education play in understanding the influence of outsourcing and information and communications technology on the degree of virtualization. In any case, there are a number of possibilities for further study, especially since studies of virtual organizations are a relatively new phenomenon.

Conclusions

The onset of the new millennium has given rise to many changes in business operations, and these operations are indicating their responses to the ever-greater demands of the marketplace. One of the changes is surely the rapid implementing of information and communication technology into work processes in order to accelerate their execution. Companies have also recognized that they lack the requisite knowledge to be able to compete successfully. In such cases, the decision to use outsourcing therefore seems to be the most suitable option. The outsourcing market is also developing in Slovenia, such that companies now have an increas-

ing number of options for finding a partner with whom to cooperate, or outsourcing partners to carry out work on their behalf. We can confirm that companies – also within the area of Slovene tourism – are becoming all the more virtual.

Employees' responses to virtualization of their company vary. In the study we determined that the majority of employees believes that outsourcing can contribute more to virtualization of the company, whereas information and communication technology does not have such a strong influence. Employees who give preference to outsourcing are, in terms of their area of education, primarily from the field of sociology. On the other hand, those who prefer to emphasize information and communication technology are from the fields of the technical sciences.

When we tried to discern factors that would most noticeably characterize respondents from each group, we determined that the inclination of employees to outsourcing is marked by three aspects, namely: those of competition, organization, and, lastly, of knowledge. The inclination of employees towards information and communication technology is marked by the economic as well as the communicative aspect. On the basis of factor analysis we also determined which of the viewpoints is more present in the individual groups of employees. The results show that employees who believe that outsourcing is more conducive to virtualization of the company are convinced that the use of outsourcing leads to greater competitiveness of the company and helps the company attain a higher level of knowledge. In the group that places greater emphasis on information and communication technology we found no statistically significant differences, which leads us to conclude that they do not agree with the positive contribution of outsourcing.

On the basis of the findings we can conclude that outsourcing is an activity that more strongly influences the virtualization of the company than does information and communication technology. Through the use of outsourcing, the company attains knowledge that it otherwise would not have, thereby increasing its range; all new knowledge contributes to the competitiveness of the company.

Notes

- 1 Outsourcing has been viewed as a form of predetermined external provision with another enterprise for the delivery of goods and/or services that would previously have been offered in-house (Kakabadse and Kakabadse 2000).

- 2 Age and work experience were not real metric variables, since the respondents were categorized into groups by age and work experience.
- 3 Variables with a measure of sampling adequacy values of less than 0.5 and variables with communalities of less than 0.5 should be omitted from the factor analysis one at a time (Hair et al. 2006).

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The Relationship between Working Capital Management Efficiency and EBIT

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This paper is aimed at analyzing the relationship between Working Capital Management Efficiency (WCME) and Earnings before Interest & Taxes (EBIT) of the Paper Industry in India during 1997–1998 to 2005–2006. To measure the WCME three index values viz., Performance Index (PI), Utilization Index (UI), and Efficiency Index (EI) are computed, and are associated with explanatory variables, viz., Cash Conversion Cycle (CCC), Accounts Payable Days (APDAYS), Accounts Receivables Days (ARDAYS), Inventory Days (INVDAYS). Further, Fixed Financial Assets Ratio (FIXDFARA), Financial Debt Ratio (FINDBTRA) and Size (Natural log of Sales) are considered as control variables in the analysis, and are associated with the EBIT. The study reveals that the Paper Industry has managed the WC satisfactorily. The APDAYS has a significant (-)ve relationship with EBIT, which indicates that by deploying payment to suppliers they improve the EBIT. The Paper Industry in India performs remarkably well during the period, however, less profitable firms wait longer to pay their bills, and pursue a decrease in CCC.

Key Words: Working Capital Management Efficiency, Earnings before Interest and Taxes, Current Assets, Current Liabilities, Performance Index, Utilization Index, Efficiency Index

JEL Classification: G30, G32

Working Capital (WC) is the flow of ready funds necessary for the working of a concern. It comprises funds invested in *Current Assets* (CAS), which in the ordinary course of business can be turned into cash within a short period without undergoing diminishing in value and without disruption of the organization. *Current Liabilities* (CLS) are those which are intended to be paid in the ordinary course of business within a short time. Every company has to make arrangements for adequate funds to meet the day-to-day expenditure apart from investment

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in *Fixed Assets* (FAS). The internal resources of a business organization often are insufficient for meeting all its needs. Also it is not always possible for the owners, promoters or the entrepreneurs to mobilize finance from their personal resources. Resources, therefore, have had to be financed through borrowing, keeping in view the short, medium and or long term requirements of trade or industry for funds.

Statement of the Problems, Significance and Scope

One of the serious problems faced by the Paper Industry in India is the incidence of sickness. There are many reasons for the sickness of the paper industry. One of the important reasons is low per capita consumption of paper in India. The industry experiences frequent dwindling demands and low EBIT. The paper industry is highly capital intensive. Some of the units that are installed in the backward areas suffer from inadequate infrastructure facilities such as lack of trained manpower, transportation and sustained power supply, the failure of industry in maintaining adequate liquidity leading to imbalanced capital structure, thereby affecting EBIT.

Very few studies have been made in relation to *Working Capital Management* (WCM) especially in the paper industry in India. Therefore, the present study is a maiden attempt to analyze the relationship between WCM efficiency and EBIT in the paper industry in India. The study covers only the listed paper companies on *Bombay Stock Exchange* (BSE) in India, for which an attempt is made to provide an empirical support to the hypothesized relationship between WCM efficiency and EBIT.

Objectives of the Study

The objective of the study is to examine the relationship between the WCM efficiency and EBIT of the paper industry in India.

The following are the specific objectives:

- To analyse the firm's efficiency in WCM in the paper industry in India.
- To analyse the relationship between WCM efficiency and EBIT in selected companies in the paper industry in India.

Review of the Literature

Experts (William 1939) determined the factors of WC and pointed out that WC is an element to be considered in fixing the rate-base. Main-

tenance of adequate wc is an essential condition for efficient financial management (Mohan 1991). wc offers huge cash opportunities that could be released with sustainability within a relative short period of time (Loneux 2004). Inventory, receivables, cash and working finance are the four problem areas of wcm (Mishra 1975). Inventory represents more than 61% of the total cas of the firm (Swamy 1987).

wc has been financed from internal as well as external sources (Fazzeria 2002). Companies have increasingly been relying on short-term funds particularly short-term bank credit and trade credit (Gupta and Sharma 2003). wc ratios are useful tools in appraising the financial strength and; immediate solvency of a firm (Sagan 1955). Current and quick ratios registered insignificant associations whilst the comprehensive liquidity index indicated significant associations with return on investment (ROI) (Smith and Bahaman 1997). The lower the level of liquid assets, the greater will be the risks of not being able to meet current obligations (Van Horne 1969).

The major reason for slow progress of an undertaking is shortage or wrong management of wc (Siddarth and Das 1993). Due to lack of a proper plan for wc requirements most firms often experience excess wc or shortage of wc (Agarwal 1977). Firms are able to reduce financing costs/or increase the funds available for expansion by minimizing the amount of funds tied up in cas. There is a significant difference among industries in wc measures across time (Krueger 2002).

The way in which wc is managed will have a significant impact on the profitability of companies. This is a significant (-)ve relation between gross operating income and the number of days of accounts receivable, inventories and accounts payables. The (-)ve relation between account payables and profitability is consistent with the view that less profitable companies wait longer to pay their bills (Deloof 2003). The chief executives properly recognize the role of efficient use of wc in liquidity and profitability, but in practice they could not achieve it due to sub-optimum utilization of wc (Prasad 2001). The Public Sector Enterprises (PSUs) could improve the wcm by reducing their dependence on outside funds (Jain 1988).

Efficient wcm is necessary for achieving both liquidity and profitability of a company. A poor and inefficient wcm leads to tie up funds in idle assets and reduces the liquidity and profitability of a company (Reddy and Kameswari 2004). Efficient liquidity management involves planning and controlling cas and cls in such a manner that eliminates the risk of

inability to meet due short-term obligations and avoids excessive investment in these assets. The CCC has been one of the more important measures of liquidity than the current ratio that affects profitability. There is a (-)ve relationship between profitability and liquidity indicators such as current ratio and cash gap (Eljelly 2004).

WCM could vitally affect the health of the firm (Sagan 1955). Industry practices, company size, future sales growth of company, the proportion of outside directors on a board, executive compensation (current portion), and CEO share ownership significantly influence the WCME of a company (Kieschnick 1960). For measuring WCME, performance, utilization, and overall efficiency indices were used, instead of some common WCM ratios (Gosh and Maji 2003).

There is a strong (-)ve relation between CCC and corporate profitability of a large sample of listed American companies during 1975–1994 (Shin and Soenen 1998). There is a significant +ve relationship between profitability, measured through gross operating profit, and CCC. Profit can be created by handling correctly the CCC and keeping each of the different components (accounts receivables, accounts payables, inventory) to an optimum level (Lazaridis and Tryfonidis 2006). There is a significant (-)ve relationship between WCM and profitability. The greater the CCC the lesser will be the profitability. There is a significant (-)ve relationship between liquidity and profitability. There is also (-)ve relationship between debt used by the firm and its profitability (Rehmann 2007).

- H_0^1 *There is no significant efficiency in the use of various components of CAS for enhancing sales in the paper industry.*
- H_0^2 *The paper industry as a whole does not have the ability to utilise all the CAS for the purpose of generating sales.*
- H_0^3 *The paper industry, as a whole does not have efficiency in WCM.*
- H_0^4 *There is no significant relationship between WCM efficiency and EBIT of the paper industry in India.*

Although ample research studies have been conducted in the field of WCM, very few researches touched on the aspects of WCM and EBIT. Therefore, to fill this gap in the literature, the study has been undertaken.

Methodology, Sources of Data and Sampling Design

The study used only secondary data, which are collected from the CMIE prowess (package). The collected data from this source have been compiled and used with due care as per the requirements of the study. Orig-

TABLE 1 Sample procedure

Type of companies	No. of companies	No. of companies listed in BSE	Sample size
Paper	113 (78%)	66 (78%)	23
Paper product	33 (22%)	19 (22%)	7
Total	146 (100%)	85 (100%)	30

inally the sample for this study had been planned to choose from the list of companies listed in National Stock Exchange (NSE). Since the number of companies listed in the NSE is small (6 companies in the paper and paper product industry), the sample of 30 companies of paper industry has been chosen from 85 listed companies in BSE.

The Sample Interval (SI) is calculated by N/n . $SI = 85/30 = 2.8333$. All the BSE listed paper and paper product companies are considered and every 3rd company is selected for the study by use of the *Systematic Random Sampling Technique*. The data used for the analysis relate to the selected paper companies for the period of ten years on a yearly basis ranging from 1997–2006.

Variables Used for Analysis of Data

ANALYSIS I: WCM EFFICIENCY

The first part of the analysis is the measure of wcm efficiency for which three indexes are used, viz., Performance Index (PI), Utilization Index (UI) and, Efficiency Index (EI).

$$PI_{WCM} = \frac{I_s \sum_{i=1}^n \frac{W_{i(t-1)}}{W_{it}}}{N}, \quad (1)$$

where I_s = sales index defined as S_t/S_{t-1} , W_i = individual group of CAS, N = number of CAS group, and $i = 1, 2, 3, \dots N$.

$$UI_{WCM} = \frac{A_{t-1}}{A_t}, \quad (2)$$

where A = (current assets)/sales.

$$EI_{WCM} = PI_{WCM} \times UI_{WCM}. \quad (3)$$

ANALYSIS II: NET EBIT

The second part of the analysis is the measure of Net EBIT, for which the following equation is formulated, based on the basic indicator.

The general form of the model is:

$$\begin{aligned} \text{EBIT}_{it} = & \beta_1(\text{PI}_{it}) + \beta_2(\text{UI}_{it}) + \beta_3(\text{EI}_{it}) + \beta_4(\text{CCC}_{it}) \\ & + \beta_5(\text{FFAR}_{it}) + \beta_6(\text{FDR}_{it}), \end{aligned} \quad (4)$$

where EBIT_{it} = Earnings Before Interest & Tax (i at time t ; $i = 1, 2, 30$ companies), CCC = Cash Conversion Cycle = No. of Days A/R + No. of Days Inventory – No. of days A/P; FDR = Financial Debt Ratio = (Fixed Financial Assets)/(Total Assets); FFAR = Fixed Financial Assets Ratio = (Short Term Loans + Long Term Loans)/(Total Assets).

Tools Used for Analysis

To analyze the wcm efficiency of the paper industry in India, statistical techniques viz *Minimum, Maximum, Mean, Standard Deviation and Co-efficient of Variation, Correlation, and Regression Matrix* have been used. To ascertain the linear trend and sign of growth in various components of wc ratios, the simple regression technique has been extensively used.

Limitations and Scope for Further Study

- The study is confined to ten years data only, i. e. from 1997–2006, therefore, a detailed analysis covering a lengthy period, which may give slightly different results has not been made.
- The study is based on secondary data collected from the CMIE prowess (package), therefore the quality of the study depends purely upon the accuracy, reliability and quality of the secondary data source. Approximation, and relative measures with respect to the data source might impact the results.
- The study is based on 30 companies of the Paper Industry in India that are also drawn from the companies listed in BSE. Therefore, the accuracy of results is purely based on the data of sample units. If one takes sample units from, say, NIFTY the results may go slightly differently.

Further studies could be made by future researchers in the following aspects and areas:

- by inclusion of extraneous variables like profitability ratios (G/P ratio, N/P ratio, etc) and analyzing the inter-relationship between the wcm and profitability;

- by categorizing the firms into heterogeneous groups like Small, Medium, and Large firms based on measures like assets, capital, long term borrowings, and Net Worth.

Industry Analysis and Findings

An evaluation of wcm efficiency of the paper industry as a whole is done here. It can be observed vide table 2 that there are occurrences of the PI , UI and EI values of above 1 in 3, 5 and 4 respectively out of 9 years. In many years, PI and EI values are < 1 , but mean value of PI is nearer to 1 (0.93) and EI value is 1.01. This shows that the Paper Industry has satisfactorily managed its wcm while handling its CAS for generating sales and has adopted a moderate wcm policy. But, the incidences of the occurrence of the most successful year ($EI > 1$) followed by the most unsuccessful one ($EI < 1$), and vice versa, have exposed the fact that the industry has been inefficient in adopting a very sound wcm policy. Moreover, the coefficient of variation (CV), which is very high at 49.12 when compared to that of PI , UI and EI , elicits the high degree of inconsistency in the wcm policy adopted by the paper industry. Further, Compounded Annual Growth Rates ($CAGRS$) are (-)ve for all the indices.

This, in turn, reveals that the efficiency in managing wcm required for various components of CAS relevant to augmenting the sales as well as wcm policy has been kept weakening further over the period of study. Overall, it can be inferred that the Paper Industry has shown low efficiency in wcm relevant to manufacturing activities, and has been inefficient in adopting a sound wcm policy on the whole during the period of study.

Regression Analysis and Results

In order to measure the firm's efficiency in achieving the targeted level of efficiency during the study period, the OLS model has been used. The estimated β value represents the speed of the individual firm in improving the efficiency in achieving the industry norms in this regard.

Firm's efficiency in the matter of managing wcm is equal to the average efficiency level of the industry as a whole. Similarly, < 1 indicates the need of the firm to further improve its efficiency in wcm.

Management of wcm is an essential condition of financial management (Reddy 1991). The wcm has highlighted the managerial aspects of inventories, receivables and advances, and cash (Rao 1985). The wcmE has been tested through a hypothesis in terms of various components of CAS .

TABLE 2 Average Performance, Utilization and Efficiency Indices showing the WCM Efficiency of the Paper Industry

Financial Year	Performance Index	Utilization Index	Efficiency Index
1997–1998	1.47	1.35	1.98
1998–1999	0.65	0.75	0.49
1999–2000	1.12	1.26	1.41
2000–2001	0.79	1.05	0.83
2001–2002	0.71	0.84	0.60
2002–2003	1.17	1.21	1.42
2003–2004	0.71	0.89	0.63
2004–2005	0.97	1.06	1.03
2005–2006	0.77	0.93	0.71
Minimum	0.65 (1999)	0.75 (1999)	0.49 (1999)
Maximum	1.47 (1998)	1.35 (1998)	1.98 (1998)
Mean	0.93	1.04	1.01
SD	0.27	0.20	0.50
CV	29.54	19.67	49.12
CAGR	–3.15	–1.67	–4.77

NOTES Computed from Financial Statements; figures in parentheses are years.

H_0^1 *There is no significant efficiency in use of various components of CAS for enhancing sales in the paper industry.*

The H_0^1 is rejected; numerically the overall $PI (> 1)$ indicates efficient WCM. Average value of PI , as a whole, shows that the PI is > 1 for 17 firms out of 30 firms. Thus, the performance of the industry as whole in WCM was mostly efficient during the period of study. Similarly, from the OLS regression results for UI it is understood that 14 out of 30 firms (β coefficients > 1) are successful in establishing their efficiency in the paper industry in the matter of utilization of CAS as a whole in generating sales.

The chief executives of the paper industry properly recognized the role of efficient use of WC in liquidity and profitability, but in practice they could not achieve it. Most of them followed the budgetary method in planning WC, and WCM was inefficient due to sub-optimum utilization of WC (Prasad 2001). The level of WC is a function of sales (Sagan 1955). This statement has been tested in H_0^2 .

H_0^2 *The paper Industry as a whole does not have the ability to utilise the CAS for generating sales.*

TABLE 3 Regression Results showing the Relationship between Cash Conversion Cycle and EBIT of the Paper Industry

Explanatory variables	Coefficient	SE of coeff.	t value	P value
Intercept	-88.3882 ²	8.9779	-9.85	0.0000
FIXDFARA	-266.6349 ²	90.5067	-2.95	0.0035
FINDBTRA	-2.7995	14.2790	-0.20	0.8447
LNSALES	27.2530 ²	1.7090	15.95	0.0000
CCC	-0.0416 ¹	0.0201	-2.07	0.0390
R ²	0.4696			
Adjusted R ²	0.4625			
F value	65.31 ²			
Degrees of freedom	4,295			

NOTES ¹ Significant at 5% level. ² Significant at 1% level.

The H_0^2 is rejected; numerically, the overall UI (> 1) indicates efficient WCM. The average value of UI, as a whole, shows that the UI is > 1 for 15 firms out of 30 firms. Thus, the utilization of WC for the industry as a whole was mostly efficient during the period of study. From the results of OLS regression for EI, it is evident that the > 1 for 12 out of 30 firms, i. e., these 12 firms have achieved targeted industry norms in respect of adopting efficiency in WCM policy.

Efficient WCM is necessary for achieving both liquidity and profitability of a company. A poor and inefficient WCM leads to tie up funds in idle assets and reduces the liquidity and profitability of a company (Reddy and Kameswari 2004). WC offers huge cash opportunities that could be released with sustainability within a relative short period of time (Loneux 2004). This has been tested in H_0^3 .

H_0^3 The paper Industry, as a whole, does not have efficiency in WCM.

The H_0^3 is rejected as the EI (> 1) shows efficient WCM. The average value of EI shows that the EI is > 1 for 12 firms out of 30 firms under study for the study period.

Relationship between WCM Efficiency and EBIT

The relationship of Earnings before Interest and Taxes (EBIT) of the paper industry with efficiency of WCM is evaluated here. EBIT is taken as the proxy and CCC, APDAYS, ARDAYS, INVDAYS are considered as measures of WCM efficiency in the analysis. Apart from these variables, FIXDFARA,

FINDBTRA and *size* (natural log of sales) are considered as control variables in the regression model. First, correlation among all selected variables is worked out and OLS regression is run, the results of the regression are presented in table 3.

From the regression results, it is apparent that *APDAYS* has a significant (-)ve association with *EBIT*, which indicates that a more profitable firm delays its payment to its suppliers. The other three *wcm* efficiency measures, *CCC* with +ve in sign, *ARDBAYS* and *INVDAYS* with (-)ve in sign have an insignificant one to one relationship with *EBIT* in the paper industry. The +ve relationship of *CCC* shows that more profitable firms under paper industry failed to reduce the *CCC*.

From the results of regression between *EBIT* and *CCC* it can be inferred that *CCC* has a significant (-)ve relationship with *EBIT*. Also, all the three control variables are related significantly with *EBIT*. The relationships of *FIXDFRA* and *FINDBTRA* are (-)ve and that of the *LNSALES* is +ve with *EBIT*. The results show that larger firms with less fixed financial assets and financial debt ratio earned more *EBIT* by decreasing the *CCC* remarkably under the paper industry.

The regression results between *EBIT* and *APDAYS* show that *APDAYS* has a significant +ve coefficient with *EBIT*. Further, among the control variables, the coefficient of *FIXDFRA* is significant at 1 per cent level and that of the *FINDBTRA* is insignificant. On the other hand, *size* of firms is highly related to *EBIT* with +ve in sign.

From the results, it is well established that the larger firms under the paper industry with less fixed financial assets earned more *EBIT* by delaying the payment to their suppliers. Regarding the relationship between *EBIT* and *ARDBAYS*, the results of regression shown in table 5 reveal that the coefficient of *ARDBAYS* is significant +vely, and coefficients of all the control variables are significant but with a different sign. While firm *size* is +vely related, *FIXDFRA* and *FINDBTRA* are (-)vely related to *EBIT* of the firms under the paper industry. In sum, it is found that the larger firms with less fixed financial assets and financial debt have generated more profit (after operating cost) by increasing the credit period granted to their customers under the paper industry.

With regard to the impact of number of days in inventory (inventory cycle) on the *EBIT* of the firms under the paper industry, the regression results disclose that *INVDAYS* has an insignificant (-)ve co-efficient with *EBIT*. On the other hand, the coefficients of *FIXDFRA* with (-)ve in sign and that of *LNSALES* with +ve in sign are significant at 1 per cent level.

TABLE 4 Regression Results showing the Relationship between Number of Days Accounts Payable and EBIT of the Paper Industry

Explanatory variables	Coefficient	SE of coeff.	t value	P value
Intercept	-93.8385 ²	9.1316	-10.28	0.0000
FIXDFARA	-259.6095 ²	89.8865	-2.89	0.0042
FINDBTRA	-9.0700	14.8742	-0.61	0.5425
LNSALES	27.6829 ²	1.7380	15.93	0.0000
APDAYS	0.0509 ¹	0.0210	2.43	0.0159
R ²	0.4724			
Adjusted R ²	0.4653			
F value	66.05 ²			
Degrees of freedom	4,295			

NOTES ¹ Significant at 5% level. ² Significant at 1% level.

TABLE 5 Regression Results showing the Relationship between Number of Days in Accounts Receivables and EBIT of Paper Industry

Explanatory variables	Coefficient	SE of coeff.	t value	P value
Intercept	-99.7462 ²	9.9563	-10.02	0.0000
FIXDFARA	-232.8214 ²	89.8986	-2.59	0.0101
FINDBTRA	-7.3206	14.6625	-0.50	0.6180
LNSALES	27.4998 ²	1.7180	16.01	0.0000
ARDAYS	0.1686 ¹	0.0709	2.38	0.0180
R ²	0.4720			
Adjusted R ²	0.4649			
F value	65.94 ²			
Degrees of freedom	4,295			

NOTES ¹ Significant at 5% level. ² Significant at 1% level.

However, the FINDBTRA has an insignificant +ve coefficient with EBIT. Overall, the regression results exposed the fact that the larger firms under paper industry, which earn more EBIT, have fewer inventories, but decrease in inventory level does not influence the increase in EBIT significantly. At the same time these firms have gained more EBIT with less fixed financial assets and by increasing the financial debt insignificantly.

There is a strong (-)ve relationship between variables of the WCM and profitability of the firm (Reheman 2007). This means that as the CCC increases it will lead to a decrease in the profitability of the firm, and

TABLE 6 Regression Results showing the Relationship between Number of Days in Inventory and EBIT of the Paper Industry

Explanatory variables	Coefficient	SE of coeff.	t value	P value
Intercept	-86.2624 ²	9.3964	-9.18	0.0000
FIXDFARA	-255.2521 ²	90.7656	-2.81	0.0053
FINDBTRA	5.6502	14.0239	0.40	0.6873
LNSALES	26.4734 ²	1.6602	15.95	0.0000
INVDAYS	-0.0622	0.0537	-1.16	0.2474
R^2	0.4644			
Adjusted R^2	0.4571			
F value	63.94 ²			
Degrees of freedom	4,295			

NOTES ² Significant at 1% level.

managers can create a +ve value for the shareholders by reducing the CCC to a possible minimum level. This has been tested in H_0^4 .

H_0^4 *There is no significant relationship between WCM efficiency and EBIT of the paper industry.*

The H_0^4 is rejected as APDAYS (F value 66.05), CCC (F value 65.31), and ARDAYS (F value 65.94) and Number of Days in Inventory (F value 63.94) are significantly related to EBIT of the paper industry. Therefore, it is inferred that there is a significant relationship between WCM efficiency and EBIT of firms in the paper industry in India.

Conclusion

The importance of efficient WCM is indisputable. Moreover, adequate WCM is essential as it has a direct impact on EBIT and liquidity. An attempt has been made in the present study to investigate the relationship between WCM efficiency and EBIT of Indian paper companies. In the matter of WCM, three indexes and net EBIT have been computed for all the firms over the period of study – ten-years.

From the study it is concluded that the Indian paper firms perform remarkably well during the period. Industry overall efficiency index was > 1 in 3 out of 9 years for the study period. Though some of the sample units had successfully improved efficiency during these years, the existence of a very high degree of inconsistency in this matter clearly points out the need for adopting sound WCM policy in these firms.

There is found to be a (–)ve relationship between EBIT and the cash conversion cycle (CCC) which was used as a parameter, therefore it seems that operational EBIT dictates how to manage the WC of the firm. Further, it is found that lower gross EBIT is associated with an increase in the APDAYS. This could lead to the conclusion that less profitable firms wait longer to pay their bills, taking advantage of credit period granted by their suppliers. The +ve relationship between ARDAYS and firms EBIT suggests that less profitable firms will pursue a decrease of their ARDAYS in an attempt to reduce their cash gap in the CCC.

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A Strategic Household Purchase: Consumer House Buying Behavior

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The aim of this study is to examine consumer house-buying behavior from the consumers' perspective. In view of the existing literature exploring consumer decision making, the purpose of this research was threefold: (a) to propose a conceptual model of consumer decision making within the frame of consumer behavior; (b) to gain knowledge of factors impacting this process from the empirical standpoint with the focus on prefabricated house purchases; and (c) to offer implications for beneficial purchases of prefabricated houses. The results of our in-depth interviews with recent owners and potential buyers of a custom-made prefabricated house suggest that cognitive and rational factors do not offer sufficient explanation of consumer behavior in the case of a high-involvement product such as a house. In addition to the idiosyncratic characteristics of the customer, his/her personal situation and environmental factors, the role of feelings, experience, subconscious factors, needs and goals should to be taken into account to better understand this kind of decision making.

Key Words: consumer decision-making, strategic purchase,
prefabricated house, qualitative research

JEL Classification: M30, M31

Introduction

The field of consumer research is mostly focused on two major questions: how consumers go about making decisions (descriptive theories), and how decisions should be made (normative theories) (Edwards and Fasolo 2001). Research directives, aimed at researching how consumers should decide, have been emerging lately. Several critiques have appeared against the existing literature which focuses almost exclusively on the marketing perspective and neglects consumers and their difficulties in decision making (Bazerman 2001; Gronhaug, Kleppe, and Haukedal

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1987). Brief and Bazerman (2003, 187) developed the idea that 'creating true value for the consumer and, thus, adding value to society is one of the most obvious ways business organizations make the world a better place'. This notion of a consumer-focused approach is also supported by Bargh (2002), who believes consumer research should balance studies of how to influence consumers with studies of how consumers could defend themselves against and control such influences.

One of the most influential areas within consumer behavior is consumer decision – making (Bargh 2002; Simonson et al. 2001; Bettman, Luce, and Payne 1998). At the conceptual level, various consumer decision-making models have been proposed in the literature in recent decades. However, many researchers believe that a specific, situation- and product-oriented model is needed in studying purchasing (Erasmus, Boshoff, and Rousseau 2001). Apart from this, investigating decisions, that can change lives of consumers, such as car or house purchase, can make an essential contribution to consumer behavior knowledge (Wells 1993). According to Erasmus, Boshoff, and Rousseau (2001), an exploratory approach with the intention to unfold the truth may provide opportunities for an understanding of the complexity of specific decision-making circumstances, such as first-time house buying.

In view of the existing literature exploring consumer decision making when purchasing high-involvement and emotionally charged products, the purpose of this research was threefold: (a) to develop a conceptual model of decision – making for a prefabricated house purchase; (b) to gain knowledge of factors impacting this process from the empirical standpoint; and (c) to offer implications for beneficial strategic household purchases. Strategic decision making refers to the process of decision making with long-term commitments of resources and affecting the budget available for other goods and services (Gronhaug, Kleppe, and Haukedal 1987, 242). Based on the existing literature, we assume that this process involves a certain amount of perceived risk, especially since it represents large financial obligations (Gibler and Nelson 2003; Mitchell 1999; Gronhaug, Kleppe, and Haukedal 1987; Beatty and Smith 1987). Our goal is also to offer implications for consumers, real estate marketers and consumer researchers. The specific product selected in this study was a prefabricated house. The house is the most important durable good in the household and requires high involvement as well as complex decision making. Some similarities can be drawn with other durable products, particularly cars. Hence, the empirical literature in this area and the

real estate literature serve as a basis for conceptual and empirical work in this study.

Theoretical Background

Consumer behavior has been an important research topic for decades. A review of existing theoretical efforts indicates a clear shift from rational to psychological and social decision factors. However, even the recent models have not managed to embrace all the knowledge in the field of consumer behavior: subconscious processes, the role of needs, goals and emotions (Bargh 2002). Apart from leaving out these important findings the existing literature also lacks studies of decisions that consumers are most concerned about, termed ‘big’ or ‘strategic decisions’ (Bazerman 2001, 500; Gronhaug, Kleppe, and Haukedal 1987, 242). Specifically, Bazerman (2001) urges researchers to further explore the most important and challenging consumer decisions, which include house and car purchases, dealing with a building contractor etc.

As mentioned in the introduction, strategic decision making refers to the process of decision making when buying strategically important goods. The following characteristics define the strategic importance of a purchase: high involvement in the process; long-term commitment of resources; truncated budget available for other goods and services. Strategic purchases imply several important categories of decisions, including:

- decisions with regard to allocation of the household budget, namely, how the household’s economic resources are influenced, e. g. for travelling, visits to restaurants etc.;
- categorization of alternatives means choosing either from various product groups (e. g. apartments or houses) or defining a more narrow product category (e. g. houses of a given size);
- decision making within the defined product category takes place once the product group is specified.

The purchase of a house may be considered as a good example of such a purchase decision. Strategic decisions are being made in a range of fields, including when consumers decide about health issues (Henry 2001) or financial investments (Henry 2005).

Considering the focus of this study on consumer behavior with respect to a very specific product, i. e., a prefabricated house, empirical research in the area of durable goods needs to be examined to support

existing theoretical knowledge. Empirical research conducted in the field of durable goods purchase behavior can be useful for at least two reasons: (a) the house is the most important durable good in the household (Hempel and Punj 1999); and (b) many studies of consumer decision making for a car or household appliances indicate that there are similarities among the buying processes related to different durable goods (Punj 1987). The majority of literature researching individual and organizational customers is dealing with buying processes of durables (e. g. Bayus 1991; Cripps and Meyer 1994; Grewal, Mehta and Kardes 2004; Hauser and Urban 1986; McQuinston 1989; Punj and Brookes 2002). Compared to buying convenience products, consumers perceive these kinds of 'large ticket' purchases as riskier, sometimes even 'traumatic' (Bauer 1960; Chaudhuri 2001; Mitchell 1999). Outcomes of such purchases are unknown in advance and some of them are likely to be unpleasant. A common attribute of durables is that the buying decision is complex, especially when the price is perceived as high.

The strongest parallel can be made with a car purchase, particularly as the car is the second most important durable acquisition in the household. Buying a house or a car highly involves the consumer, as this decision binds their economic resources in the long run (Arndt 1976; Gronhaug, Kleppe, and Haukedal 1987; Grewal, Mehta and Kardes 2004; Rosenthal 1997). Both product categories offer a rich variety of price and quality, are complex and relatively well known to consumers (Brucks, Zeinthaml, and Naylor 2000; Bayus and Carlstrom 1990). Similarly, the buying decision for real estate as a subgroup of durables is also complex and demands high involvement (Gibler and Nelson 2003). In most cases, consumers consider several possibilities, compare them and ultimately make a selection (Bayus and Carlstrom 1990). In comparison to frequently purchased items, learning on a basis of trial-error is uncommon when buying expensive, complex products (Bazerman 2001).

Prior to model building efforts, however, characteristics of the product in question need to be identified. A prefabricated house differs from other fixed property (i. e., a traditional built house) in one major characteristic – it is movable up to the point when it is set up in a selected location. Other attributes of this product are that its components are prepared in advance in specialized companies, and put together on the construction site at a later time. Manufacturers offer a variety of prefabricated houses. The house typically consists of standardized prefabricated components which are later adapted to customer specification.

With the support of an architect, customers can custom design their house by changing the layout of the house, selecting the materials, size of the house, etc. (BDF 2004).

Development of a Conceptual Model

In this study, a conceptual model of consumer behavior and the buying process was developed for the means of conducting exploratory research in the later stages. Our aim is to propose a model that can enhance our understanding of consumers from their point of view.

Recent findings in consumer behavior research conducted by psychologists and sociologists suggest that the following perspectives be acknowledged in the development of new conceptual consumer buying behavior models (Hansen 2005; Erasmus, Boshoff, and Rousseau 2001; Loewenstein 2001; Peter and Olson 2002):

- the role of subconscious factors should be taken into consideration;
- the context and the product should define the decision-making research;
- alternative decision-making strategies should be allowed;
- types of heuristics used by consumers should be explained;
- the role of feelings affecting the decision-making process should be considered, and
- the interplay of consumer's cognitive and affective skills should be included.

Based on these recommendations, Peter and Olson's (2002) cognitive processing model appears to be the most appropriate theoretical basis for consumer decision making and behavior with respect to the product investigated in this research. These authors suggest that the 'consumer decision-making process is a goal-directed, problem-solving process' (Peter and Olson 2002, 168). The major advantage of this model is that it accounts for the weaknesses of previous models by considering cognitive, affective as well as environmental factors. Nevertheless, this model is of a general nature, accounting for neither the specific characteristics of the product in question nor the context of the purchase situation.

Against these theoretical and empirical backgrounds, a conceptual model of the buying process is proposed in figure 1. Its components consist of the cognitive processing model by Peter and Olson (2002) set within the general consumer behavior model (Hawkins, Best, and Coney

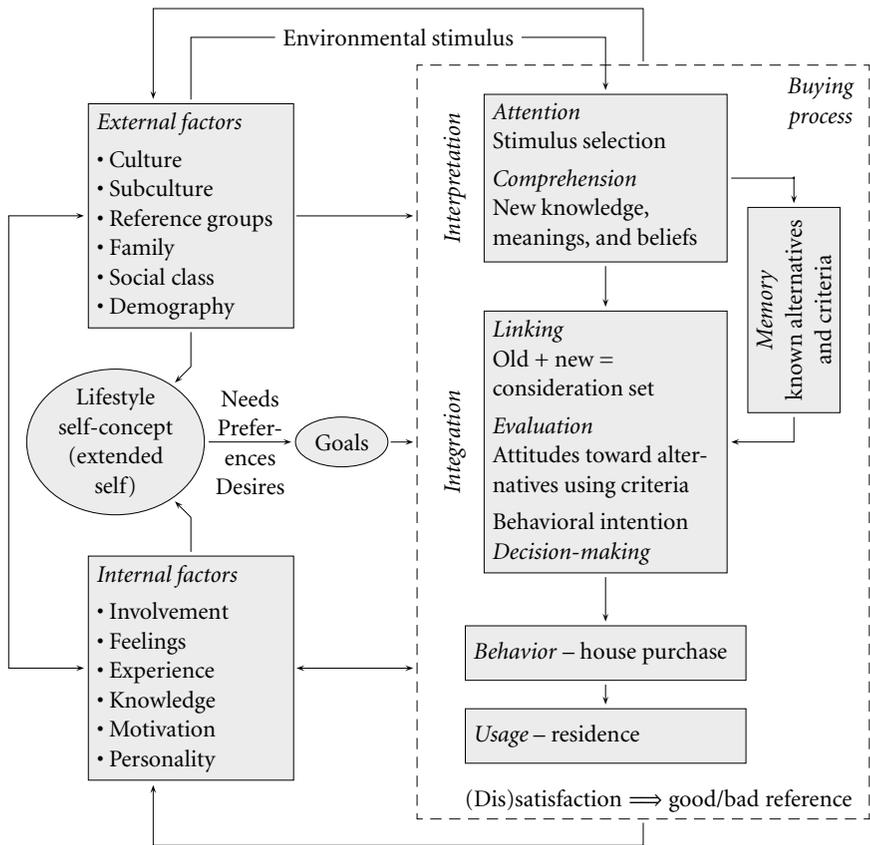


FIGURE 1 A conceptual model of the buying process

2003). The latter can be described as external and internal factors contributing to the formulation of self-concept and lifestyle, which affect the consumer decision process. During this process, experiences and acquisitions update the original external and internal influences. The conceptual model is discussed in the next paragraphs.

While the buyer believes that the characteristics of a certain product should fulfill his/her goals and needs, the choice of a product will also reflect a person’s self-concept and his/her lifestyle. In figure 1, it can be seen that lifestyle and self-concept influence goals through needs, desires and preferences, and the goals define the decision making.

As indicated in figure 1, the antecedents of the purchasing process include two groups of determinants which influence a buyer’s lifestyle and his/her self-concept, which through his/her needs, desires, preferences,

and goals determine buying behavior pictured in the right box of the model in figure 1. The group of internal factors includes the level of an individual's motivation, involvement, his/her personality, feelings, attitudes, perception, knowledge, learning and memory. The external factors indirectly impacting the buying process account for social factors such as characteristics of the culture of the buyer, an individual's social class and subculture, household characteristics of the buyer, his/her reference groups and demographic factors.

The model suggests that an individual's lifestyle and the meaning a person wants to acquire by owning a product influence his/her needs and desires concerning this product. In the case of buying a prefabricated house, the choice of the materials and layout directly reflects the lifestyle of a household unit or a family. It is believed that in the early stage of the buying process, decision makers usually do not have sufficient information. Therefore, they continuously gather new information and adapt their desires and goals accordingly. The ultimate goal is to own the product. Since the buyer's involvement is high, the ultimate goal is divided into a hierarchy of sub goals which lead the consumer to the end goal. According to Belk (1988), a house presents a strong source of personal identity. The extended self as part of the self-concept plays a major role. Hence, we posit that a custom-made house will reflect its owners' individuality and their personal style

The source of information related to the product purchase can be internal (memory) or external (environment); in both cases, information can be acquired by coincidental find and/or intentional search. The search is influenced by several factors divided into three categories: situational determinants, product determinants and consumer characteristics. Also, an interesting question to be explored empirically is how consumer knowledge about available alternatives in the market and about product criteria is created. For a complicated product such as a house, the information stemming solely from a buyer's memory is generally inadequate (Gibler and Nelson 2003). Factors such as experience, marketing communication, distribution and individual goals all influence the evoked set formation. The choice of criteria for evaluation evolves in a similar fashion. Factors such as a buyer's specific goals, his/her motivation, involvement, product knowledge and similarities among alternatives may play a role. Context specific criteria (for a prefabricated custom-made house) include objective physical properties specified by a manufacturer, e. g., quality, warranty, isolation, price per square meter.

Other features such as the house size, its ground plan and location are not decisive criteria for a custom-made prefabricated house as they are defined by the buyer.

As indicated in the right box in figure 1, the stages of the buying process are as follows: attention, comprehension, evaluation, decision making, behavior and usage. The goal 'to own a product' leads the consumer to a conscious interpretation of information linked to this goal. New information is interpreted and linked to existing knowledge. As a result, new attitudes towards the alternatives are formed. The buyer usually does not get to know all the alternatives simultaneously; rather, new alternatives are gradually added. Therefore, the customer experiences the process of interpretation and integration over and over again. The evaluation takes place for both the new and the known alternatives.

As far as the specific product in the study is concerned, we dealt with prefabricated house purchase, since this presents a good example of strategic purchase or decision making. There is a higher level of complexity in this process. This is usually associated with high involvement on the buyer's side, and high perceived risk, therefore the decision process is more deliberative and the external information search is more extensive (Beatty and Smith 1987). A custom-made prefabricated house is a product not bound to any specific location. Hence, the location itself is not a consequence of the purchase, although it may notably influence the choice of criteria in the buying process. The decision making process will also depend upon the situation, available alternatives in the market, a buyer's motivation, his/her involvement and prior knowledge with the product (Hawkins, Best, and Coney 2003). In addition, product specification offered by the producer may be of major importance to the potential buyer. Along with the objective physical properties of the product, the level of service offered by the company as well as adaptability of the basic house design offered may play a role in consumer decision making.

Methodology and Data

The second stage of this research involved exploratory research of the conceptual model of the buying behavior with respect to a custom made prefabricated house. A number of factors prompted us to utilize qualitative research methods, i. e., in-depth personal interviews with consumers. First, the qualitative approach enables researchers to gain a deeper understanding of consumer behavior in the context of complex

TABLE 1 Demographic data for the selected sample

(1)	Owners			Potential buyers		
	SU1	SU2	SU3	SU4	SU5	SU6
(2)	–	–	6 years	1 month; 2.5 years	5 years	14 years
(3)	840–1260	840–1260	above 1670	1260–1670	840–1260	above 1670
(4) F	66	21	35	30	36	43
M	70	28	43	35	37	43
(5) F	Graduate	Highschool	Graduate	Graduate	Highschool	Graduate
M	Graduate	Highschool	Graduate	Graduate	Highschool	Graduate
(6)	Bled	Krško	Brezovica	Ljubljana	Ljubljana	Celje

NOTES Row headings are as follows: (1) sample unit, (2) age of children, (3) monthly household income (in EUR), (4) age, (5) education, (6) settlement.

and empirically unexplored product purchase. Second, due to the nature of the product, the buying process is rather complicated and requires high involvement on the part of a consumer. Third, results of a qualitative study can yield useful directions for further quantitative research (Kumar et al 1999; McDaniel and Gates 1998; Miles and Huberman 1994). As our conceptual model suggests, a variety of different factors influence the process, which gives the selected methodology additional relevance.

In this research, six semi-structured in-depth interviews were carried out; three interviews with recent owners of a custom-made prefabricated house and another three interviews with potential buyers of the same product. Consequently, we avoided biasing toward house-ownership on the one hand, and on the other hand we collected data from highly involved potential buyers. Given the limited population of informants relative to the specific objectives of this research, our sample was selected on a non-random basis. More specifically, we used a referral method, starting with a couple who were opinion leaders for prefabricated houses. First, an appointment was made with potential respondents by telephone. Subsequently, interviews were carried out in the participants' households. One or two decision makers in the household participated in the interview. Topics of discussion followed the established interviewing protocol. The interviews lasted from 45 to 90 minutes and they were audio-taped. The sample was composed of households with 2 to 4 members from different areas of Slovenia. The basic characteristics of the respondents are presented in table 1.

Data Analyses and Findings

In the analytic stage of our research, we followed the procedure for analyzing qualitative data by Miles and Huberman (1994). These guidelines enable investigators to produce compelling analytic conclusions and enhance the internal validity of the study. The analyses involved three types of activities: data reduction, data display and conclusion drawing. The data reduction process began with compiling the literature review, developing the conceptual framework for the study and setting up the procedures for data collection (e. g., respondent selection, interview guidelines). Audio tapes with interviews were transcribed and reviewed several times by the researchers. According to Berg (2007), content analysis is the most appropriate technique for analyzing interviews. The conclusion drawing was based on the cross-case (i. e., household) comparisons, reference to previously reviewed empirical studies and to the theoretical framework developed in this study. Examination of patterns, themes and regularities provided the basis for drawing conclusions.

The results of our analyses confirm the notion that the house is a product closely related to the human self-concept. While the product has different meanings to different people, a custom-made house carries a subjective message of its residents and presents a strong source of personal identity. This is consistent with the literature in the field (i. e., Belk 1988; Downs 1989). With the exception of a single sample unit, all respondents view the house as a part of their personality or the extended self. The house ownership enables them to express their personality and lifestyle. Relative to the house owners of the house, the sample group of potential buyers of the house expressed a stronger desire for homeliness and warmth. In general, women and men perceived a house differently. While women 'feel' the house and relate to it on the emotional level, men tend to evaluate the house more on the rational and functional level. However, both women and men believe that 'the feeling of wellness' in the house is an important choice criterion.

Conceptually, we posited (figure 1) that lifestyle exerts a certain influence upon buyers' needs and desires as well as upon indirect external and internal determinants of the buying process. The households included in this research proved to lead quite different lifestyles, and most of them wanted the custom-made house to reflect their lifestyles. Reasons behind the respondents' decision to buy/search for a custom-made house are similar across the sample units. Namely, the household

members are intimately familiar with their desires and lifestyles which lead to their house design preferences. On the other hand, the manufacturers/producers have little knowledge of this aspect of their individual customers' lives. In contrast to the owners, potential buyers emphasized the existence of a continuous tradeoff between their desires and needs in their decision making for the house. Table 2 provides an overview of the main common themes and quotes, reflecting each theme in a more detailed manner.

Based on the empirical findings of this study, it is our contention that people want to have a house designed according to their ideal self-concept while taking into account realistic limitations. This result is consistent with Gibler and Nelson's (2003) position that people want a house to reflect their actual or ideal self-concept. We found that the ground plan and the choice of materials in the house directly indicate the tenant's lifestyle, either actual or ideal. Respondents mentioned various circumstances as reasons for their home purchase; however, they all related this purchase to a higher quality of living.

Our findings confirm that the buying process in the case of a custom-made prefabricated house is influenced by both internal and external factors. Along with previously discussed general determinants, factors frequently mentioned by our respondents were: marketing communications in the housing market, other people's opinions, time pressure, and the seller's (manufacturers') behavior. By analyzing qualitative data gathered in this study, it appeared that most respondents form their attitudes toward the manufacturer/company at the moment when they contact the seller.

Our interviews reveal that recommendations provided by friends or other house owners with experiences and information about the custom-made prefabricated house were very important. It seems that word-of-mouth recommendations might be even more important in a house buyer's information gathering and evaluation stages than the seller/company's behavior. Moreover, we found that the owners of the sample house played a major role in making potential buyers enthusiastic. That is, they honestly shared their experience about living in a wooden prefabricated house, and the potential buyers see for themselves what it is like to live in such a house.

Along with making a favorable first impression, the seller/company also needs to follow its customers after the purchase. Consistent with the literature suggesting that the external factors exert an important in-

TABLE 2 Common themes and quotes from the in-depth interviews

Lifestyle, needs and desires, self-concept

M5: 'Brand of prefabricated house and wood show your thinking, your attitude toward nature, environment. It depends on what type of person you are. With the house you want to show your personality, how you think, how you live.'

M5: 'You slowly build the whole picture and when it is done, you know what you are looking for and what you want. If you decide too quickly, your "dream house" falls down like a castle in the air, because you find out that your needs are different, that the optimal house is different.'

F6: 'I'm drawing the plan for our house by myself. I hope it's ideal. I've done my best and have tried to take into consideration as many factors as possible to make the plan ideal.'

Attitude formation

F1: 'We visited one company and a lady received us. I believe she had a terrible headache that day and completely ignored us. Her behavior was intolerable, therefore we said to ourselves, let's go, they even don't want to sell houses here. One visit was enough.'

External factors (word-of-mouth)

F1: 'Our friend architect recommended us this house saying it has the best isolation and that we will be most satisfied with this one. And this is the reason we chose it.'

M2: 'We have gathered most information from people who have already purchased house. Such people share information in the best way.'

F3: 'A coworker recommended this house to my husband, and after we collected some information about the producer, we saw they are really good. I trusted this company because of the recommendation.'

M4: 'What other people told us about their experience was the most valuable information for us. People who tell us their honest opinions, although they are not our close friends.'

Internal factors (emotions)

F1: 'A house is very emotional. People build a house with lots of emotions. It's not just about money and reason.'

F3: 'Because the house is wooden, for us at the time an unknown material, we felt quite some fear. You get into this with some fear. But after we had visited several houses, we got the feeling that a wooden house is very pleasant.'

M4: 'There is a lot of emotion involved in buying a house. Reason starts later. First there is emotion, and then you start with reason. But all the time the two parameters interact.'

F4: 'I try to consider my emotions, I don't want to forget about them.'

fluence, particularly for less experienced customers (Gibler and Nelson 2003), we also probed into the role of social factors in the respondents' buying process for the house. The influence of culture can be identified in the buyers' desire to own a custom-made house, i. e., based on their

TABLE 3 The main external factors, which influence sample units

SU1	SU2	SU3	SU4	SU5	SU6
<ul style="list-style-type: none"> • Reference groups • Time pressure • Company's behavior 	<ul style="list-style-type: none"> • Family • Marketing communication • Reference groups • Income • Company's behavior 	<ul style="list-style-type: none"> • Reference groups • Time pressure • Company's behavior 	<ul style="list-style-type: none"> • Reference groups • Income • Company's behavior 	<ul style="list-style-type: none"> • Marketing communication • Reference groups • Income • Company's behavior 	<ul style="list-style-type: none"> • Reference groups • Family • Income

individualistic preferences. In their study, Gibler and Nelson (2003) suggested that the value placed on individualism as a part of culture is reflected in the demand for customized homes. Table 3 summarizes the main external factors for each sample unit interviewed.

As suggested by our conceptual model for the study (figure 1), the group of internal factors which mostly influences the decision/making process, includes an individual's motivation, involvement, personality, self-confidence, knowledge, affect, and prior experience. Findings of our empirical work seem to corroborate the notion that a custom-made house requires high involvement and strong motivation. This was reflected in an intensive search for information about various producers/sellers in the housing market. Our respondents actively engaged in information gathering, mostly because they found their existing knowledge insufficient. This stage was followed by comparing and evaluating identified alternatives of the product. In the buying process for a house, an individual's affect played an important role. This was reflected in the feelings aroused when imagining the house, meeting with company representatives, and when inspecting a sample house. This conclusion is consistent with Bargh's (2002) suggestion that researchers should focus more attention on subconscious processes, needs, goals and affect. In comparison to existing house-owners, potential buyers much more strongly expressed their feelings with respect to their future house. Also, women emphasized their feelings more than men. Table 4 provides the main internal factors, which could be identified during the interviews.

However, considering a house purchase is financially demanding for most buyers, cognition also plays an important role, particularly with respect to evaluation of its price and its functionality. High involvement is reflected in an intensive information search about different house pro-

TABLE 4 The main internal factors, which influence sample units

SU1	SU2	SU3	SU4	SU5	SU6
• Emotion					
• Self-confidence					
• Experience	• Experience	• Involvement	• Experience	• Experience	• Experience
• Involvement	• Involvement		• Involvement	• Involvement	• Prior knowledge
					• Involvement

ducers. While most of our respondents had no previous experience or knowledge related to house purchase, they gradually gained sufficient self-confidence in making decisions on their own.

Our conceptual model (figure 1) suggests that the consumer decision-making process is composed of several stages, strongly intertwined with each other. As our sample consisted of two groups, i. e., the potential buyers and the owners, the two groups experienced different stages. While the group of potential buyers only reached the stage of evaluation of the alternatives, the group of house owners was in the stage of having bought and using the house.

Our findings suggest that the purchase criteria used by individual households include product characteristics or specific consequences of buying a certain alternative. Five respondents went through a cyclic process of improving already established criteria with additional new knowledge, gained from producers, building experts, and prefabricated house owners. The criteria used for choosing a house among the respondents in this study can be ranked as demonstrated in table 5 featuring the essential criteria for each individual sample unit and ranked based on their importance. The most commonly used criterion was that the house is custom-made. The second most often used selective criterion is company's behavior, namely, how the representatives of the house producer communicated with the potential buyers. Two significant choice criteria with respect to a house as a product were also quality of the product and its price. What respondents mentioned several times was feeling confident about the company. This means that potential buyers need to have trust in the company's process of production and delivery of their house. Taking into consideration the fact that different house producers offer different architectural solutions, four respondents also mentioned the importance of this characteristic.

TABLE 5 The most important criteria of individual sample units (SU) for choosing a producer of a prefabricated house (ranked according to their importance)

SU1	SU2	SU3	SU4	SU5	SU6
• Wooden house	• (3) Quality	• Fast construction	• (3) Price	• Fast construction	• Custom-made house
• Prefabricated house	• Isolation	• Custom-made house	• Quality	• Architectural solutions	• Quality of materials
• Isolation	• Natural materials	• Quality	• Warranty	• Architectural solutions	• Technical suggestions
• Construction	• (1) Custom-made house	• Architectural solutions	• Architectural solutions	• Quality	
• (5) Architectural solutions	• (4) Confidence in the company	• Architectural solutions	• Confidence in the company	• Isolation	
• (2) Company's behavior		• Biohouse	• Biohouse	• Warranty	
				• Company's behavior	

NOTES Numbers in front of criteria present ranking: (1) as the most often used criterion, (2) as the second most often used criterion, etc.

Decision making in the case of house buying is a complex process, composed of several minor processes. While respondents used different criteria for evaluating alternatives, no more than ten alternatives composed the consideration set of an individual household. Moreover, less than five alternatives were included in the final stages of respondents' decision making.

Our results indicate that consumers use two approaches or principles when evaluating the alternatives, (a) gradual concentration and evaluation of separate alternatives, and (b) simultaneous evaluation of several alternatives. The first principle is much simpler to use as it only focuses on one alternative at a time. This result is consistent with Loewenstein's (2001) research, indicating that people have limited capabilities and knowledge, which in turn prompts them to simplify their information processing.

The choice criteria mentioned earlier carry different meanings to different decision makers. If a producer/company and its offering meet the most important criterion, it is considered in further stages – this is the evaluation principle called 'elimination by aspects'. Peter and Olson (2002) describe this mode of integration as a non-compensatory process whereby salient beliefs about positive and negative consequences do not balance or compensate for each other. This principle has been documented in other empirical studies as well, e. g., choice of ground coffee

(Fader and McAlister 1990), choice of road and rail freight (Young et al. 1982), choice of fictitious cars (Isen and Means 1983), career decisions (Gati 1986), and choice of washing machine (Lee and Geistfeld 1998). After forming a positive attitude toward a certain company (its offering) on the basis of previously formed criteria, the buyer forms a behavioral intention which leads either to a purchase or to a search for additional information/ideas.

Finally, our analysis suggests that a house buyer's consideration of a specific manufacturer/company depends on two major factors, (a) information kept in memory, and (b) the word-of-mouth recommendations. Once the potential buyer actually buys the house, he/she experiences either satisfaction or dissatisfaction. This, in turn, creates grounds for recommendations to other people. The results of this exploratory research with in-depth interviews can be graphically depicted by exposing those factors in the conceptual model, that could be explored more in detail in future studies (figure 2).

Discussion and Implications

In the previous sections of this paper, consumer house purchasing behavior was analyzed from theoretical and empirical perspectives. Both of these provide a sound basis for a deeper understanding of the factors underlying the consumer buying process for a custom-made prefabricated house.

The conceptual model of the buying process for a custom-made prefabricated house developed in this study consists of three main groups of variables: the buying process itself, the external and the internal factors indirectly impacting the buying process (through a buyer lifestyle and self concept constructs). The results of our empirical research confirm the notion that cognitive and rational factors alone do not offer a sufficient explanation of consumer behavior in the case of high-involvement products being purchased only a few times in a person's lifetime. In addition to the idiosyncratic characteristics of the customer, his/her personal situation and environmental factors, the role of feelings, experience, subconscious factors, needs and goals should to be taken into account when analyzing the buying process. Our empirical work suggests that the following evaluative criteria should be exposed as decisive in the evaluation stage of the buying process: that the house is custom-made, professionalism and reputation of the seller/company, quality, price, and architectural solutions. Along with the emotionally charged internal fac-

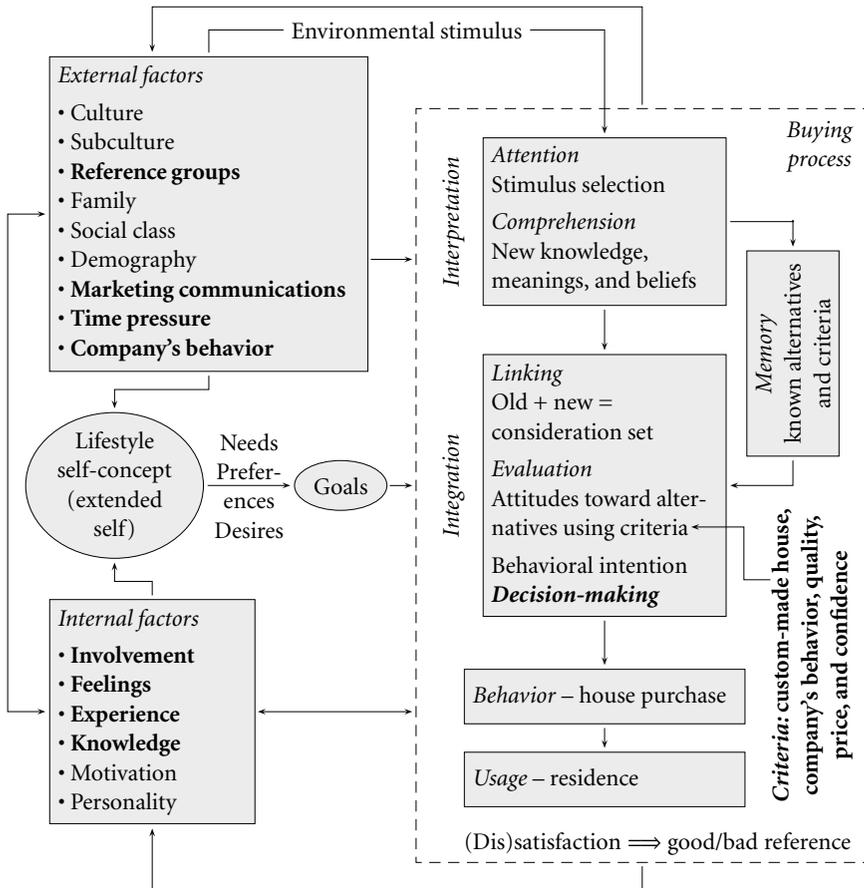


FIGURE 2 Main factors in the conceptual model of the buying process

tors, which carry heavy weight in initiating the purchase, other factors identified in our qualitative analysis include his/her experience (with the product and the seller) and his/her prior knowledge. Significant external factors impacting the buying process in our qualitative study included recommendations from people's buyer trust, the seller/company's behavior and marketing communication in the housing market.

The findings of this study offer implications for consumers who are making a strategic purchase, such as buying a house. Gronhaug, Kleppe, and Haukedal (1987) have warned that households may have serious problems in making wise strategic purchase decisions. Buying a house is a long-term decision from at least two aspects: it is financially binding, and it is the sort of product 'consumed' in the long run. We suggest

that the first significant step for consumers is to define the needs and goals they want to achieve by purchasing the house. The next step is to gain as much information about different available alternatives and criteria as possible. Importantly, external information search is a way to increase knowledge, and reduce perceptions of risk and uncertainty (Dowling and Staelin 1994; McColl-Kennedy and Fetter 2001; Mitra, Reiss, and Capella 1999). This was also confirmed in our empirical study. Several studies have shown that consumers exhibit limited prepurchase information search, even for expensive durable goods (e. g. Beatty and Smith 1987; Ozanne, Brucks, and Grewal). Furthermore, our empirical research suggests that consumers have a very limited knowledge about houses and the buying process. We emphasize that gaining additional knowledge is of critical importance. Namely, knowledge should include both dimensions, knowledge by acquaintance (emotion) and by description (reason) (Chaudhuri 2000). Sources should vary from producers to existing owners, sample house-owners, and independent expert evaluations (sample house owners and independent expert evaluations are the most valid sources). We suggest that consumers experience the house independently of its producer. The findings of this study indicate that experience with company's representatives immensely contributes to consideration set formation and decision making. Nevertheless, potential buyers should give less emphasis to this factor, as quality of the house does not depend on the skills and behavior of the seller. Our observation is that a long-term view is required: the consumers will be living in the house far longer than the duration of their contact with the seller. Decisions should be made based on direct comparison of evaluated alternatives regarding previously discussed goals and needs in order to find the best match.

Implications for real estate marketers can also be drawn from the stated findings. Understanding individual decision making can greatly contribute to improved explanations and predictions in the real estate context (Gibler and Nelson 2003). This knowledge enables the real estate companies to be able to better match their customers' desires with their offer. Consumers' needs for information have to be satisfied in the pre-purchase process. Given the high level of buyer involvement, housing and real-estate companies should focus on building confidence and satisfaction in their potential and existing house owners. Our results also suggest that offering a pre-purchase experience with the house is desired as well. In this way intangibility, which is one of the antecedents of perceived risk, can be diminished (Laroche, Bergeron, and Goutaland 2003).

Attitudes based on direct experience with the product are much firmer than those based on indirect experience (Berger 1992). An additional step companies could take is to provide information about 'product usage' in a brochure form for the buyers. In conclusion, awareness is required that consumers are not buying just a house, but a home.

In view of the fact that the conceptual model developed in this study includes the role of external environmental factors, including the culture and market factors, it can be applied to cross-cultural markets. When the product-buyer relationship characteristics are similar, (i. e., high involvement in the process, motivation to search for information, and experience), the model may be applied to any geographical area. It is believed that cross-cultural differences may lie primarily in the weights that buyers assign to individual factors impacting their buying process. Also, further qualitative and quantitative empirical efforts are required in order to gain knowledge of the interactive effects of various factors impacting the buying process in the case of a custom-made house, and to determine how buyers assign weights to various evaluative criteria in their decision-making process.

The results of this research should be viewed from the perspective of limitations inherent in this qualitative inquiry. As our goal was to examine buying behavior for custom-made prefabricated house, the available population was rather limited. We focused on one brand with quite a few unique characteristics. Due to the confidential nature of the data, the company was not allowed to dispose its customers' data, which would allow for a more systematic selection of the study participants. However, it is hoped that by proposing a conceptual model of buyer behavior with respect to house purchase and testing it empirically, this study contributes to a better understanding of the buying process for a strategic product. The results of this research may offer a springboard for future research in this field.

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