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# The Emerging Knowledge Economy

The crucial importance of concentrating on products and services with a high value added component is repeatedly stressed in policy documents in Western Europe today. The perspectives to compete on the basis of low costs are not particularly favourable for advanced economies, and the more so since the rise of new competitors, not only in East Asia but especially in Eastern Europe. Moreover, the level of scientific and technological level in these latter countries must not be underestimated.

So in Western Europe we are increasingly forced to think about our real competitiveness. How come that countries like Germany, the Netherlands or Belgium remain so strong on export markets? The answer is of course specialisation. Approaching the question from this side we get very specific: we concentrate on competitive advantage in specific industries. But is it possible to give an answer at a higher level of aggregation? What does it really mean: producing high value added products and services? Usually, the answer at that level remains vague: 'added value' has remained a quantitative economic concept without qualitative content. As far as a content is given to the concept, mostly a narrow technological interpretation is offered. We then think about high-tech products and discussion on competitiveness rapidly narrows down to figures about R&D expenditure.

In many cases it has, however, appeared that the most profitable enterprises, which produce a high added value in the economic meaning of the word, are not specifically the high tech ones. Profitability is quite evenly distributed amongst industries. So, it appears that technology is not the (sole) answer.

In this article I defend the thesis that in order to understand the qualitative meaning of 'adding value' nowadays, it is important to understand the dynamics of the emerging knowledge economy. First it has, however, to be clarified that 'knowledge economy' and 'information economy/society' are not identical concepts. A problem of the information society is that information is abundant and in a certain sense also meaningless. One of the big issues in that society is to transform information into meaningful knowledge. And from the perspective of enterprises meaningful knowledge means 'productive' knowledge. So, with the term 'knowledge economy' I want to look at the 'information society' from the perspective of the kinds of knowledge which are requested to create economic added value.

## The Basic Paradox

In four steps I will try to clarify that the crucial capability in the knowledge economy is the ability to combine different kinds of knowledge in a productive way. This may appear like a trivial statement–especially since Joseph Schumpeter already in the beginning of the century defined innovation as the making of 'new combinations'. But when we agree on this, why do we not give it the due attention–e.g. in education and (management) training? Most of the (a.o. policy) discussions on the information society and the knowledge economy concentrate on technological capabilities and infrastructure. So let me reformulate the point: my thesis states that Schumpeter's approach applies today more than in his own time. The higher the level of technological development, the more crucial the human capability to combine different forms of specialisation becomes.

Technological knowledge in this respect is certainly not unimportant, but anyone who is reducing the discussion to this form of knowledge, is missing the point. To the contrary, I want to emphasise that maybe the most important paradox of the knowledge economy is that the more society is becoming technology-based, the more knowledge about people and human or social relations in general is becoming the differentiating competitive factor. Two sub-arguments

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can be distinguished in this respect: (a) because one of the important capabilities in the knowledge economy is to understand rapidly changing customer needs and their satisfaction, (b) the capability to combine this capability with the more technical ones requires a high degree of human capability to combine different forms of specialisation.

## A Fourfold Development

Four developments can be identified in the emerging knowledge economy which are closely interrelated, but which succeeded each other in time. For this reason also attention for each of these shifted subsequently.

*Informatisation*

The first development is informatisation and digitalisation, i.e. the broad application of information technology which has made it possible to make all kinds of business processes more efficient, as well individually as in their interfaces with other processes. This is the process which has provided the 'material base' for the other developments and which is also the easiest to oversee. Each generation of computers leads to a new wave of applications in ever broader areas. A field which is being conquered nowadays is that of meetings. In electronic group decision rooms it is possible to brainstorm electronically in a freer way and to come more rapidly to a consensus. And through network technologies and video conferencing it becomes possible to meet internationally without travelling.

Informatisation also has enhanced more rapid technology and product development. With CAD it is no more necessary to make prototypes of all try-outs. Possible components can be integrated and evaluated with specific features and behaviour variables. Access to state of the art-knowledge is nearly real time through international databases and forums on the Internet. Also within enterprises the 'functional walls' between departments can be levelled through more rapid information flows. In this way concepts like concurrent engineering and lean production in which the cooperation between departments is stressed, have emerged. Also co-development and co-engineering together with suppliers is facilitated by electronic networking and electronic data interchange. Finally, in the execution orders can be transmitted more precisely and rapidly, externally towards the suppliers, and internally even directly to CNC machines–even when Computer Integrated Manufacturing (CIM) is only in a few industries on the agenda. The application of these technologies must not be overestimated, and also in the application in many cases there are more than a few shortcomings, so that the full potential of the technologies is not utilized. It remains, however, true that there is an acceleration in the application of information technology at all levels of society. One important consequence of this are the strongly shortened life cycles of many products and technologies.

*Shorter life cycles*

This shortening of product and technology life cycles is the second important development, which, besides, is not a purely technological issue. Entrepreneurs have taken the technical possibilities as an opportunity to increase the variety of their products. And consumers have reacted to this by becoming ever more unpredictable. This again has stimulated the creativity of enterprises in devising new approaches to catch the attention–and spending–of consumers. At the same time consumer reactions are continuously monitored and fed back in the process of product development and adaptation. A clothing company like Mexx e.g. is already bringing out no less than ten collections per year. For this photographers are continuously monitoring changes in clothing patterns in different parts of the world and sending pictures to the product development department of the company.

This shortening of the life cycles is of course no little problem for many firms. Some of them, e.g. in car manufacturing, are already trying to decrease this product variety and to lengthen again the life cycle of their products. This does, however, not alter the fact that the tendency is still in the direction of more differentiation and smaller market niches.

*Immaterialisation*

A development within the shortening of product life cycles–so important that I take it for a different, third development–is the increasing importance of the 'soft', immaterial components of products and services. Fashion and 'imagology' are advancing in ever more industries. These immaterial elements are relatively more important than the harder, material elements and require a wholly different kind of knowledge: about changes in markets, tastes, values and patterns of living. Products may be technologically very sophisticated and manufactured in a cheap and efficient way, when they are not attractive, 'sexy', they may me impossible to sell. There is an increasing awareness of this. For example, Philips recently launched a number of household appliances developed with the help of the Italian designer studio Alessi, which has proven to be very successful. For beer to enter a higher segment of the market, it appears necessary to change the design of the glasses, bottles and crates. The Dutch producer of dairy products Menken van Grieken managed to increase its turnover by 20% only by introducing a new attractively designed packaging.

However, in many cases a nice design is not enough. Efficiency has be part of the design, for the customer but also for the manufacturer. So, from the start of the product development user friendliness and efficiency of the production process have be taken into

account. Sometimes the combination of both concerns –notice: again the combination of capabilities–leads to a more efficient design of–fewer!–components. This again leads to a smaller chance of problems during the use of the product. So a purely 'art for art's sake' type of design should be avoided, as well as contrived appliances containing all of the latest technical trimmings. The idea is to design a user friendly product with a short and concise manual. We all possess telephones that have many more functions than we can manage to use. (Re)tuning televisions, radios and video players is a chore few people look forward to. In the United States and Europe many regular users of services and discussion forums on computer networks, prefer to access the more expensive Compuserve network to the cheaper Internet simply, because the former is so much easier to use and also more secure.

In general it has been demonstrated in different surveys that firms which invest in product innovation create more and better paid jobs than the ones who concentrate on process innovation. But at the same time at the policy level, these results are only marginally taken into account. A reason for this is that it is not analysed in a sufficient way what specifically contributes to the success of successful product innovation[2] so that not the right policy conclusions can be drawn from this.

For this reason I develop somewhat more on the immaterial forms of knowledge which prove to be so important in the emergence of a knowledge economy. This applies to all kinds of industries. E.g. when some years ago Phillip Morris acquired the food concern Kraft it paid nearly $ 13 billion, whereas the 'hard assets' of the firm accounted for no more than $ 1,3 billion. So 90% related to intangibles, amongst which elements like brand names, patents, reputation, goodwill, but also the knowledge and experience of the workforce and its relations in a multitude of networks. And such in a 'traditional' sector like the food industry!

For all these reasons Tom Peters distinguishes six 'software layers' in a product: (1) 'embedded smarts', i.e. embedded electronic software and monitoring devices, (2) design and user friendliness, (3) providing above average customer satisfaction, (4) the logistics of the delivery process, (5) the reformulation of service, e.g. through consulting the customer while selling the products, (6) entertainment, 'fun'[3]. Inspired by this, I have developed a so-called added value or knowledge ladder, which is reproduced in diagram 1.

*Diagram 1.*

**VALUE ADDING IN THE KNOWLEDGE ECONOMY**


The starting point for my approach with the 'knowledge ladder' is the producing firm. Of course, in the knowledge economy, this is not the only party which has access to knowledge. Much of the knowledge is in

2 There is of course a huge 'learning from the best' management literature, but there is still an abyss between this field and that of policy making. A book which had some impact was the MIT international benchmark study by Dertouzos, Lester and Solow, Made in America, 1989.

3 Tom Peters, Liberation Management, 1992, New York, Fawcett Columbine, p. 649.

the hands–or better: the heads–of suppliers, buyers and ultimately also customers. Therefore, from a business point of view a large part of the knowledge is metaknowledge: knowledge about the way other actors deal with their knowledge, to which it can respond. Incidentally, businesses are supported more and more by specialised suppliers of knowledge: for each of the knowledge levels, there are specialised agencies. The ladder also helps to understand the interface and the networks between manufacturing and specialized services. The manufacturing industry is in fact more and more surrounded by a network of technological institutes, management consultancies, design agencies, engineering consultancies, advertising firms, suppliers of training courses and organisers of workshops and presentations.

I have not the space to explain extensively the different levels of the ladder here[4]. There is, however, one layer on which I want to develop a bit further to illustrate the case. A very strong competitive advantage can be established by developing not so much a new product as a new, integrated product/service concept, ideally related to a whole range of products and/or services. Examples are McDonald's, Swatch, CNN, Club Méditerranée, Ikea. According to Edward de Bono, the guru of creative management, in the near future firms will take the development of new concepts as seriously as that of new technologies. Therefore they will establish separate Concept R&D groups within the firm. Integrated concepts are in most cases related to what De Bono calls value drivers : convenience and user friendliness, quality of life (leasure time, health), the fact that people like to show off with some special products (self-importance) and distraction. Value adding must be taken quite literally here. For that reason De Bono also talks about 'valuefacture'[5].

Of course, the relative significance of each of the knowledge levels is very different according to the industry: in the steel industry 'integrated values' will be of less importance than in businesses that focus on final products; in sciencebased industries, such as the pharmaceutical and the microelectronics industry, it is of greater importance to be constantly in touch with developments in science and technology than it is in the retail sector.

*Human networks*

After informatisation, the shortening of technology and product life cycles and the increasing importance of intangibles like fashion, servicing, image and entertainment in the process of product differentiation, the fourth development relates to the ever more crucial role of human networks. The shorter the life cycles become, the higher the demands in the direction of the teams which have to devise, design, produce, market and deliver the products and services. Tolerance vis-à-vis the 'weaker brothers' in the process is decreasing rapidly–and this is not only the case for people on the workfloor but also for top managers! Increasing flexibilisation and networking are some of the consequences of this. Firms try to concentrate on their real strength, their 'core businesses' or 'core competences'. This does not always mean that they are closing or selling businesses. But at least more autonomous units are created, which can concentrate on their core and behave in a businesslike fashion as well with other units of their firm as with the outside world. And when an extern supplier provides better value for money than the internal one, in many cases the former will be chosen. As a consequence an enterprise like ABB has grown into a collection of not less than 1,300 separate firms and about 5,000 profit centers.

Networking here certainly is not a purely technological issue, even when electronic infrastructures have become the necessary precondition for it. The economy rapidly becomes a matter of specialisation and combination. In order to take advantage from rapidly changing opportunities, one of the key capabilities becomes the ability of bringing together and making cooperate in an efficient and productive way people with different strengths and competences. In some markets (e.g. construction) this has been the custom for a longer time, but also in the more 'common' product and service markets this becomes increasingly the rule. In such teams one has to be really able to count on each other, as the strength of a chain is the strength of its weakest link. People who are underperforming do not get a second chance, they are out definitively. Quality is no more an issue, it is a basic precondition.

For this reason in Japan a lot of attention is given to the preparatory 'game'. Is the possible partner reliable, as well from the human as the technical perspective? In the 'Californian' variety of networks, the pattern is more nervous. One acts very fast, tries and tests each other. When it works, the others become part of the 'Rolodex' (directory). So the next time again an appeal will be done on them. So also underlying this practice there is a pattern of trust and reputation, which allows to save transaction costs.

Communication in electronic networks also leads to further informalisation and flattening of human networks. Without further ado people address each other with their first name. Bill Clinton e.g. receives each day hundreds of e-mail messages beginning with 'Hi prez'.

But especially the way people are working and doing business together is changing: concurrent engineering, early supplier involvement and user-producer interaction are no forms of distance, detached cooperation, but to the contrary very intensive processes

4 Here I have to refer to my chapter »Added Value in the Knowledge Society: 'Hot Air'« in Rob Bilderbeek, Dany Jacobs, Sven Maltha, Pim den Hertog, Immaterial Investments a an Innovative Factor, 1995, Apeldoorn, TNO-STB, p. 23–44.

5 Edward de Bono, Sur/Petition. Going Beyond Competition, 1992, London, HarperCollins.

of 'travelling together' in the same–be it not always very clear–direction. In many cases this requires a high level of very specialistic knowledge exchange in project teams. For this mutual trust is an absolute requirement. Suppliers, amongst which also the more creative service suppliers related to different forms of immaterial knowledge, sometimes work for longer periods in the premises of the main contractor or the project leader. Sometimes some of the contractor's machines are lent to the suppliers. Systems integrators like shipbuilders or airplane manufacturers do not possess the knowledge at the level of subsystems, so that sometimes they are even not the links in the value system which add most of the value.

Very important is also the architecture of co-operation. In functionally organized firms production time is sometimes no more than 5% of the total throughput time. So much of the automation processes which concentrate on production do not lead to much increase of productivity. At the same time, where products travel from one department to another, it is also more difficult to improve the process and the product as only a few people really oversee these in totality. So for this reason it is important that within and also between firms the walls between the functional departments are not only lowered–this is indeed possible through informatisation, the first development–but really levelled.

Teams have to be made where it is possible to relate to the whole process–of course in more complex processes it will be necessary to decompose the system to subunits, but also there segments should be isolated on which teams can work and improve in a more integrated way.[6]

Part of this organisation or architecture issue is the fact that it is ever less economically justifiable to use a relatively expensive, well qualified workforce as mindless 'negligible quantity'. The skills and capabilities of the workforce has indeed become too expensive to allow it to be wasted in such a way. It may be rational to transfer parts of production to low cost countries. But in many cases this is only a too easy admission of the companies that they have proved themselves incapable to leave behind the old tayloristic division between thinking and doing, of being unable to tap the most direct source of knowledge they possess, i.e. their own workforce. In this sense this is only a flight forward which does not solve their basic problem, to transform themselves into learning organisations. And this is no hopeful signal about their chances of survival in the emergent knowledge economy. The fact that Japanese companies are able to collect on average a hundred times more ideas from their workers has been an important factor in their success. One of the workers of Nedcar–the former Dutch Volvo factory which is now a joint-venture of Volvo, Mitsubishi and the Dutch state–which was sent to Japan in the framework of the preparation of the production of Mitsubishi cars, was amazed by the difference in the approach of the Japanese: "There, management listens to what the most simple factory man has to say, where we were used that we only had to listen to what the engineers had to tell us".[7] Successful enterprises know how to utilize the knowledge and experience of their workers by involving them in the processes of development, production and continuous improvement in general. Enterprises certainly also have to become leaner, but in the end they will only become more productive and efficient when they are able to mobilize and utilize their internal and external networks. This complementary element of the necessary reorganisation processes has not got the necessary attention until now. Companies in Western Europe may have suffered less from the 'corporate anorexia' which has ravaged large parts of the U.S. (and the U.K.). However, in both regions adaptation to the needs of the emerging knowledge economy has remained haphazard and insufficiently thought-out.

## Different Forms of Knowledge

The added value or knowledge ladder in diagram 1 shows the different forms of knowledge which are necessary to pursue successful innovation. As already stated, according to the industries the importance of each form of knowledge will be different. But in general the combination of developments which I have reviewed, demands a lot of the management of enterprises in all industries. Basically four different kinds of knowledge are required and have to be combined–diagram 1 is no more than an elaboration of these four forms:

- market knowledge; knowledge about market segments (a.o. industrial markets) and their size, nationally and internationally; knowledge about changing customer demand and behaviour (demographics, life styles, values, tastes, fashions, susceptibility for advertising and imagology); how to provide better servicing and ways to tie–if possible emotionally–customers to the firm or the product; organising customer feed-back;

6 The Dutch 'socio-technical school' has emphasized this architecture element of the integrated process of development and manufacturing for many years and has also developed practical guidelines for this (a recent, comprehensive exposition of this approach is: L. de Sitter, Synergetisch produceren, 1994, Assen, Van Gorcum). The more recent Business Process Reengineering movement (cfr. Michael Hammer, James Champy, Reengineering the Corporation, 1993, London, Brealey) is stressing the same points, but has not yet reached the same level of practical sophistication.

7 NRC Handelsblad, 21–1–1994.

• technological knowledge: knowledge about new technologies, about materials, about production and production processes (also from an environmental point of view; including logistics and distribution); knowing how to transform new technological opportunities into useful and attractive products; design in relation to user friendliness; knowledge how to take advantage of computers, CAD/CAM, electronic networks; quality control;

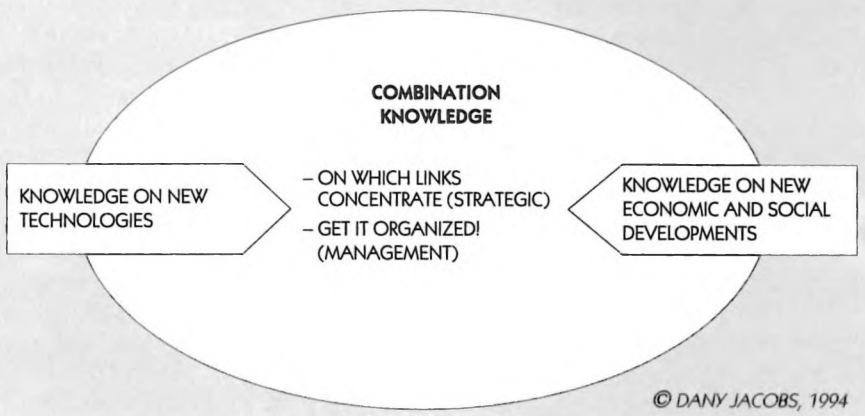
• strategic knowledge: knowing how to organise strategic processes in order to choose (on the basis of which concept?) within the manyfold combination possibilities between markets, products and technologies on which combination(s) to concentrate; where to invest internally (core business/competences), where to outsource or to co-operate externally (with whom, in which fields?);

• organisational knowledge: how making these choices work? how making teams work, internally and with external partners? how making flatter, leaner organisations? how integrating learning processes in production and development? how linking marketing and (process and product) development? how working co-operatively with external partners without being pillaged? how making parts of the organisation more autonomous and accountable while also organising synergy at a higher level? how developing and sharing a common vision of the firm? how motivating the workers productively (individually and in teams)? Many people think implementation is the easy part. But the more this process depends on people, the more difficult it becomes. At the same time, however, such a situation provides the most opportunities for finding new and creative solutions on the basis of which enduring competitive advantage can be built. Therefore, more than ever human knowledge and social skills are required: personality (creativity, an open mind, tolerance, relaxed stress immunity), entrepreneurship (believing in something, keeping to it against the stream, but without stubbornness; being individualistic, but also social), team skills (negotiating, bringing about new combinations, having a general knowledge and respect for each other's specialisation)[8]; knowledge of languages and an ability to communicate...

These four basic forms of knowledge are represented in diagram 2. On the left one finds knowledge about new technological opportunities that need to be attuned to (possible future) demands on the market, on the right. This is achieved by the strategic positioning of the company and its product range, and the execution of this strategy–possibly the most difficult form of 'combination skill' there is–, in the middle of the figure. Success in business is closely linked with creating access to and making practical use of these forms of knowledge, and with establishing the necessary (choices about) combinations in an efficient way.

*Diagram 2.*

**FORMS OF KNOWLEDGE IN THE KNOWLEDGE-SOCIETY**




## Conclusions and Recommendations

The discussion on the knowledge economy and knowledge intensification has to be liberated from the technological straitjacket to which it has been largely confined until now. I have presented a broad overview of the different knowledge levels which need to be linked in order to achieve successful business strategies within the emerging knowledge economy. Failing to successfully combine these knowledge levels will almost certainly result in a failure to achieve the desired return from material as well as immaterial investments. This is why it is undesirable to focus exclusively on the 'hard' technological components and limited indicators, such as R&D investments, in designing industrial and technological strategies and policies.

Recently the utilization of market knowledge has gained somewhat more attention[9], but especially the crucial field of combination knowledge has remained underestimated outside the fields of their specialized elaboration. Of course it is possible to follow all kinds of training in each of these fields, but it has to be recognized that at least at a general level, each of these fields has to be part of the intellectual luggage

8 The reader will understand that I totally share Richard Pascale's thesis in *Managing on the edge* (1990, Penguin) that managings always a balancing act between extremes.

9 Cfr. especially Hamel & Pralahad's, *Competiting for the Future*, 1994, Boston, Harvard Business School Press.

of everybody with some business or policy responsibility. Otherwise we will go on to under-utilize the skills and capabilities of our workforce.

For the average business person, it will be far from easy to stay in touch with all these knowledge levels. This explains why those managers who are successful at maintaining this overview are in such a strong bargaining position. Moreover, a distinct result of this development is that the knowledge economy is becoming more and more a network economy. As already mentioned, industrial manufacturing businesses increasingly rely on specialized suppliers of knowledge: technological institutes, management consultancies, design, engineering and advertising agencies.

A prerequisite of a successful knowledge economy is, that all participants are informed adequately about the various areas involved, which will enable them to communicate and cooperate successfully with other experts. Thus, in education, the emphasis at all levels should be put on nurturing future team workers and networkers, T-shaped specialists (broad enough to be able to communicate and cooperate, with deep specialist knowledge in one area to bring as their contribution into teams and networks) which are required in the emerging knowledge economy. For example, in socio-economical courses (most importantly in business management) more attention should be paid to recurrent and important basic technologies, while technology students should learn about the types of knowledge which combined with technology will lead to successful innovations. In both instances, thinking in terms of integrated concepts should be developed more intensively (cfr. above on De Bono's approach) and more attention should be paid to practical team skills (e.g. insight into one's own negotiation style and culture in relation to those of others).

In general social sciences should not be despised, as is so much the case in discussions on the knowledge economy. Knowledge from social sciences is e.g. not only requested to understand new developments in ever more turbulent markets, but also as practical knowledge necessary to make combinations work productively.

In management science knowledge on the different aspects of the learning organisation, and in economy about the different elements (especially the immaterial ones) of the information society and the knowledge economy should be enhanced. To give one example: the international statistics about immaterial investments and about performance in services are not up to the mark. From international Eurostat figures on international trade in services it appears e.g. that the Netherlands would earn eight times as much from the export of film and TV as the United States, a highly improbable achievement!

Finally, in the field of policy much more has to be done to diffuse best practice experiences at the level of each of the knowledge levels of the added value ladder presented in diagram 1. Just to give also one example here. At different levels (regional, national, international) many initiatives are taken to upgrade the technical capabilities of SME's. Until now, however, the other forms of knowledge related to the knowledge economy get too little attention in these. It is obvious that much more could be done in this respect[10]. With best-practice of course we do not suggest that there is only one solution for everybody. In the age of differentiation it is, to the contrary, important to make more explicit the 'menu' of choices and opportunities available for each kind of company. One of the great challenges of the knowledge economy is indeed the transformation of information into practical knowledge to individual forms, large and small.

10 Two exceptions are the Australian Best Practice Demonstration Program, administered by the Australian Manufacturing Council, and the television series 'KMO Partner' (SME Partner) on the Flemish TV channel BRTN