Knowledge Mobilization and Academic Entrepreneurship

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Abstract

The development and evolution of any system-person, organization-nation depends on how the system succeeds to bridge the gap between what the system knows and what the system does (with the knowledge). We call this the gap between knowing and doing or the knowing - doing gap.

If the system does not do what it knows, it will lose out in competition with other systems, its relative performance in any field will decline, it may run into stagnation and face destruction.

When a system succeeds to do what it knows, the knowledge of the system will increase in time, giving the system new opportunities for doing. There is positive feedback between knowing and doing. Many nations are unable to make use of the knowledge pool available in the world. They prefer to stagnate. For the science/university system we observe, that a lot of knowledge and capabilities, learned and acquired, do not make into the economy. We also observe firms endowed with first class engineers and scientists, producing sometimes outstanding knowledge, even protected by patents, but somehow this knowledge idles around, does not find its way into new products or technology.

It seems that "something" is missing in the concept of the knowledge society, knowledge management and similar ideas. That something is the factor which bridges the gap between knowing and doing, that transforms knowledge into action. We call this factor entrepreneurship and the persons bridging the gap entrepreneurs.

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Our focus is on academic entrepreneurs, those bridging the gap between knowledge produced in the system of science and the prob-lems they face when applying this knowledge in the economy. We call academic institutions, who try to bridge the gap between knowing and doing the entrepreneurial university.

Keywords: *Entrepreneur, Entrepreneurial Energy, Entrepreneurial University, Evolution, Transfer of Knowledge, Innovation, Knowledge, Long Wave and Basic Innovation, Knowing-Doing Gap, Types and Functions of Entrepreneurs, Economic Development.*

1. The Illusion of Knowledge

In itself, knowledge does and creates nothing. Knowledge in itself is dead matter.

To give a hypothetical illustration: Let us pick the best brains (Nobel Prize winners) in each science and let them do a time travel into a Stone Age economy. Compared with the local folk, they are all genies, endowed with unbelievable amounts of knowledge. What happens to this knowledge? Can it contribute something to uplift the meager subsistence of Stone Age people? Can they provide higher productivity and better health care? Without turning into entrepreneurs or without bridging the gap between knowledge and practice these eminent brains remain - economically speaking - an unproductive resource. They do not contribute to development. They even may get killed or chased away, because the locals may perceive them as using up their meager resources without contributing anything worthwhile to their subsis-tence.

What the illustration teaches us: Knowledge does not travel automatically into the mind and hearts of other people. Knowledge and competence gaps can be so huge, that the knowledge is non-transferable. There is a pool of knowledge. But due to low absorptive capacity, knowledge (theory) cannot transform into practice. A lot of knowledge is actually not protected by intellectual property rights. It is freely available. Everybody could make use of it. Why does this not take place more often? Our answer: entrepreneurship and non-existence of the conditions which make for entrepreneurial action (rights, competencies, willingness; see figure 3).

This actually is an old insight. Joseph Schumpeter, the Austrian-born

economist, has said it over and over again, for the first time in 1911. The distinction between invention and innovation, drawn by Schumpeter, is the classic acknowledgement of this point. Without entrepreneurs, "inventions are dead". The idea, that economic development is based on "knowledge", on the "advancement of our knowl-edge" is "wrong". This is a "thousand times proved by the miserable fate of the inventors". Schumpeter wrote this in 1911 (p. 480).

We, as members of "knowledge societies", seem to see this differently. Our discussion here nevertheless follows the Schumpeterian lead[1]. We indeed come to a conclusion very similar to him. It is ironic to see how much fuss is made by inventions and their patenting[2].

Knowledge turns into a productive resource when it becomes fused with entrepreneurship. In other words: knowledge must somehow become embedded into entrepreneurial action. How this is possible is shown below. A knowing-doing gap arises when the process of integrating knowledge into entrepreneurial action becomes handicapped.
I am aware that this is hard stuff to swallow for science people, for teachers and educators, for agents operating in the systems of science and education. It may go against their belief systems, the institutional ethos of the organizations in which they work, and of course, against the popular belief of a (post-modern) knowledge society as the high est level (western) society has reached in its course of evolution.

1- As the reader of this piece will discover, the approach presented here is unashamedly Schumpeterian. I indeed believe that the most we can contribute to our topic has already been contributed by the scientific creator of development economics (in a wide sense). For me, it is a pity to see, what authors after him have done with the genie of Schumpeter. I see no reason to move outside the framework provided by Schumpeter. It is indeed the single and most outspoken scientist having formulated the problems discussed here. What Schumpeter has not done, and he knew this very well, is delving more deeply into those factors, "causing" what he calls "entrepreneurs" to act as they act. Following the authentic Schumpeter is a path less traveled, less secure, but most needed. Few of the decision-makers in the economic and political system have ever been there before. Yet our troubled world may wait for it, and the path is at hand.

2- For an illustration see the report of the Enquete Commission of the German parliament concerning the importance of patents for technology transfer, as incentive for knowledge production, for innovation, and so on (Deutscher Bundestag, 2002, pp. 286-293). A professorial colleague in chemistry once told me: "We have a lot of patents outstanding. Why you talk always about the lack of innovation in the university."How is it, we may ask, that a country like China, with a patent law nearly nonexistent, achieves a growth rate 5-times higher than the "capitalistic" knowledge societies of continental Europe. And how is it, that more than 95% of the patents issued are never used (according to the president of the European patent office)?

Development is seen to be caused by innovation, and innovation is driven by entrepreneurs. Capabilities, rights to innovate and motivation are the primary causes of innovation. Knowledge impacts on these, but is not a prime mover of development. This theoretical framework requires some clarification.

In our paper, a special focus will be the contribution of institutions of higher learning as universities to economic development. Universities are traditionally seen as producers of knowledge, capabilities and skills. What is their development contribution? If knowledge and competencies do not on their own contribute to development, how can universities can become agents of development, and how can they contribute to an eradication of poverty and to an enlightenment of ordinary people and decision-makers? There is not automatism at work. Look at the Middle Ages in Europe. Wonderful universities.

Stagnant economy. Look at universities in Africa, in some Near-Eastern countries. The same. Then look at Cambridge, UK. Cambridge University seems to be a dynamo for regional development. What makes the difference?

Innovation means putting new knowledge into practice by new recombination of resources. This requires bridging a gap between **knowing** and **doing**. Overcoming the knowing-doing gap is a main function of any kind of entrepreneurship. The mainstream function of universities is not considered to be "entrepreneurial". The task of universities is teaching, education, research. Their contributions to de-velopment are considered by-products and unintended effects of their main functions.

Figure 1 illustrates that with each long-term economic cycle or

Kondratieff/Schumpeter wave, knowledge intensity increases and the role of science and academic entrepreneurship becomes more crucial. The fifth wave and those still coming, are crucially dependent on knowledge produced in the science system and those able to make innovative use of it. If a society misses out on any of these trends (knowledge, science, entrepreneurship), it will be "punished" with a lower growth rate, living standard and a paucity of new employment opportunities. As the lower part of figure 2 shows, there is a definite trend to theory-based innovation and entrepreneurship during the course of economic development (at least, this is our hypothesis). The knowledge intensity increases from Kondratieff (long wave) to Kondratieff.

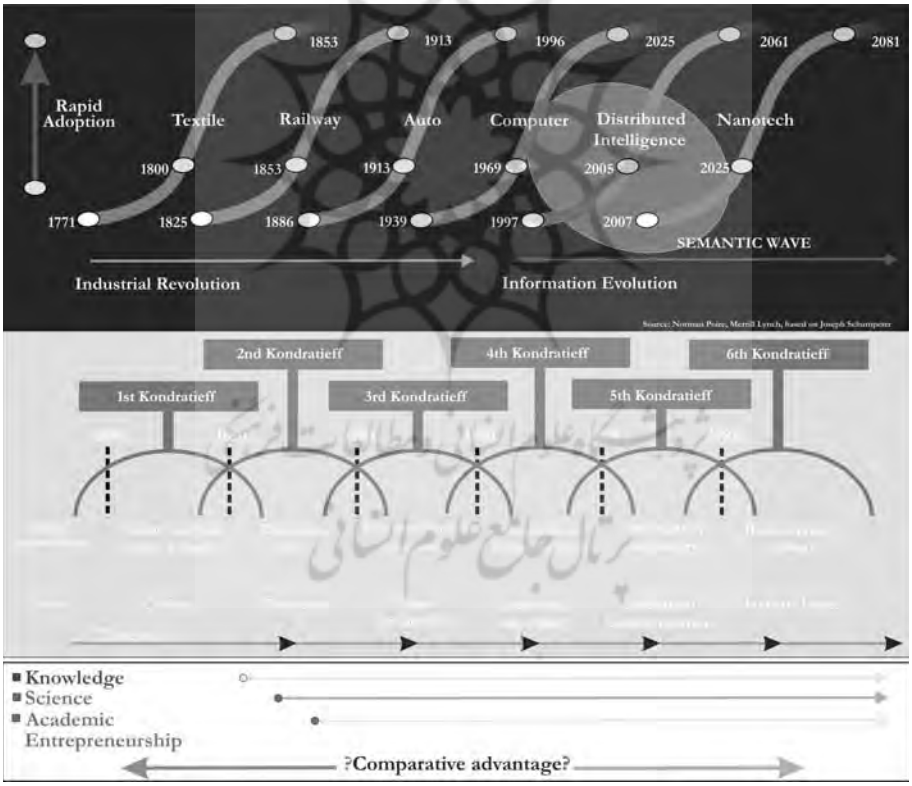

Figure 1: Kondratieff Waves and Knowledge Production

Science is an evolutionary opportunity for increasing the probability of

innovation.

From the standpoint of economic development, the most important question is: how do we get entrepreneurs excited about investing in the implementation of new knowledge created in the science system of society. As entrepreneurs become energized, knowledge creation and application, technical change, capital accumulation, would likely proceed more or less smoothly and on the way create employment opportunities and wealth. Growth makes the rich richer and the poor richer.

These are well established facts[3]. Where opinions divide is how to account for growth/development.

Why should this be problematic at all? Do modern societies not achieve more or less spontaneously if not automatically satisfactory institutional solutions for the use of (scientific) knowledge? Unfortunately, this is not the case. Modern society operates on the operational closure of its functional systems (for details see later). Each subsystem (economy, science, politics, etc.) operates on its own logic. Science and economy function with a high degree of autonomy.

If each subsystem is closed towards informational inputs from other subsystems, as modern systems theory tells us, how can knowledge from science enter the economy?

In later sections, we analyze the mechanisms available for disseminating knowledge and technology.

Let me state now the core point of the argument:

Even if academics are doing their research for the most philanthropic and idealistic reasons; the only way the scientist is ever going to get any of his results into the economy is by the intervention of entrepreneurship.[4] If you believe this to be just a problem of developed economies, which operate at the frontier of knowledge and which therefore need for their innovational activities a permanent supply of scientific ideas, you are probably mistaken. The challenges India or the Philippines (see citation below), faces are fundamentally the same as for the US.

On the status of the 103 R&D studies implemented [in the Philippines]... only 6.79 % are utilized and commercialized. ... This

3- See the impressive accumulation of data and reports by the World Bank under: http://econ.worldbank.org/programs/poverty/library/.

4- See Nelsen (n.d, p. 284) for a similar argument concerning the dissemination of medical researchinto the health system (the patient).

status contributed to a very low adoption rate of research outputs... .

The research activities were not disseminated to the clientele (Dumlao, 2003).

For a similar constellation, look at a multinational firm operating in a developing country. How does the knowledge of this firm enter the host country? What factors determine whether the knowledge is spreading outside its organizational boundaries or remains exclusively owned by the firm?

For an answer, let us distinguish between two constellations:

- Those who know provide their knowledge to those who do not know.[5] This situation is at the core of so-called *knowledge management*. This popular approach faces several difficulties, independently of what systems of management are employed[6]. They seem to result from a single overriding fact: those who know are *not* identical with those who do not know.
- Those who know are the *same* persons as those who undertake to work with what they know. This constellation still leaves us with many difficulties to master, but they are from a different kind than those of knowledge management. As soon as the person who knows is identical with the person who undertakes, we encounter no difficulties with asymmetric information/knowledge, i.e. situations that some people have information-others have not. On the contrary, in an important sense, the assumed identity of knower and doers overcomes the asymmetries of information and knowledge in a (theoretically) similar way as cooperatives and other userowned firms overcome the difficulties of firms doing business with stakeholders,[7] who are different from the owners of the firm, or with entrepreneurs, who, confronted with hesitant banks and financiers, are financing their projects themselves or via friends.

This distinction allows us to introduce the main thesis of our paper.

5- We leave for the moment undefined the meaning of knowledge. For an elaboration see the appendix.

6- For a critical discussion of numerous approaches see Kalmring (2003). The difficulties we discuss on the following pages often remain invisible to an observer due to his specific conceptional and theoretical concepts employed.

7- Stakeholders = employees, suppliers, customers, banks, government, media, regulators, etc.

Universities and other institutions of higher learning are producers of knowledge. But this knowledge offers just a potential for innovation, nothing more. Only entrepreneurial action based on knowledge can transform potentiality into (economic value creating) reality. With an increasing scientific intensity of knowledge production, the gap between what is known (in science) and what is done (in the economic system), seems to increase figure 2. What can the members of these institutions do themselves in order to bridge the "gap"? Our answer will be they must mutate into entrepreneurs. This may require a transformation of the function of universities. If this transformation does not come along, our prediction is: universities will become more and more irrelevant in knowledge societies.[8] The "law of accelerating returns" (Kurzweil, 2001, 2003) will bury them.

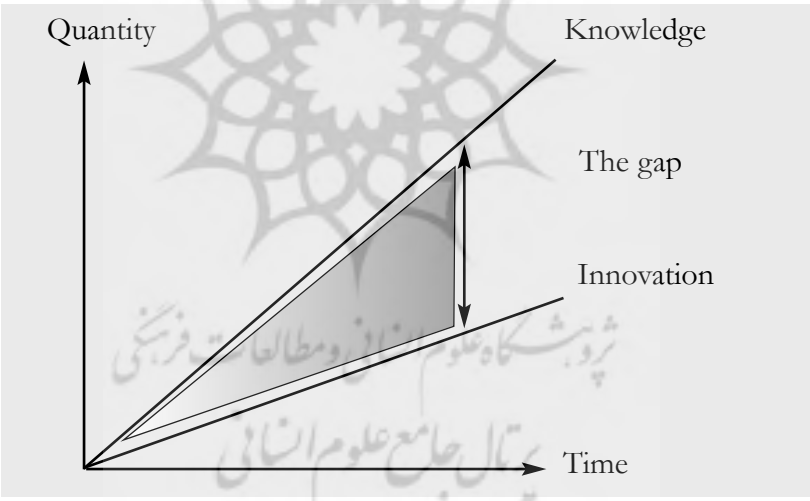

Figure 2: The Innovation Gap

Simply knowing - recognizing or understanding what to do in order to manage an organization, to do research, to prepare a talk/lecture - is not enough for an individual to become a successful manager, researcher, teacher/speaker. It is also not enough to get the knowledge produced in one system of society applied in another one. One of the

8- We are not only alone with this view. Peter Drucker has said similar things. See also Swanson (2006).

first to mention this explicitly was the Greek philosopher Aristotle:

"With action, the goal is not to explore and to recognize, but to do. We do not observe that only with knowledge from books, somebody can act as a doctor" (Nicomachean Ethics, X.10, 1179b; X.10, 1181b).

In every system on every level we observe a fracture between what is known and what is done. The astonishing but in the end, as our discussion will show, not really surprising thing about this is the non-relevance of this gap to the actors within the system. In general, the awareness of a gap is non-existent. Those who "own" the information and knowledge do not observe such gaps, they do not care, they have no incentive to change their behavior, and often they lack the right to do so. Result: Knowledge remains unapplied, problems remain unsolved, etc.

Again, we may ask why this is a problem at all. Living standards for many peoples are increasing, productivity is increasing, life expectancy is increasing. Where is the problem? The trouble becomes obvious, if we return a moment to figure 1. If economic development is more and more based on scientifically produced knowledge, i.e. knowledge "owned" by the science system, then obviously the comparative ability to make productive use of this knowledge decides to a much larger degree than earlier (Schumpeter waves 1-4) about the performance of firms and nations. Those who bridge the gap more effectively march ahead, those who do not are left behind.

In the standard model of economic growth, we are not faced with this difficulty, since it operates with different theoretical software. We call it the input logic as compared to the development logic, which allows us to observe the gap. According to the input logic, knowledge, wherever produced, will foster growth. Knowledge is either a free or public good or can easily transfer from those who own it to those who need it. In the development logic, this model breaks down and is seen falsified by empirical facts.

In the German language, two phrases summarize our problem:

- "Vielwisser aber Nichtskönner" (People who know a lot but are poor achievers/doers);
- "Hochqualifiziert aber inkompent" (Highly qualified but incompetent

people).

2. The Knowing-Doing Gap

Two American management academics, Jeffrey Pfeffer and Robert Sutton (2000), became intrigued by the large number of managers and executives that they worked with who knew what needed to be done but failed to implement it.

They referred to this phenomenon as the "knowing-doing gap."

"The so-called knowledge advantage is a fallacy - even though companies pour billions of dollars into training programs, consultants, and executive education. The reason is not that knowledge isn't important. It's that most companies know, or can know, the same things.

Moreover, even as companies talk about the importance of learning, intellectual capital, and knowledge management, they frequently fail to take the vital next step of transforming knowledge into action. The Knowing-Doing Gap confronts the paradox of companies: know too much and do too little by showing how some companies are successful at turning knowledge into action."(From the book jacket)

This observation reminds me of a common definition of entrepreneurship:

Entrepreneurship
It's not how
many ideas you have,
it's how
you make them happen.

To make new ideas happen or apply new knowledge in creative ways depends on three necessary conditions (see below and figure 3). Let us apply the concept to the science system or a university. A traditional university creates ideas (information and knowledge). An entrepreneurial university not only creates ideas. It makes university-created ideas happen. It transforms knowledge into action.

Figure 3 illustrates the gap, based on the three-factor-model of entrepreneurial action.

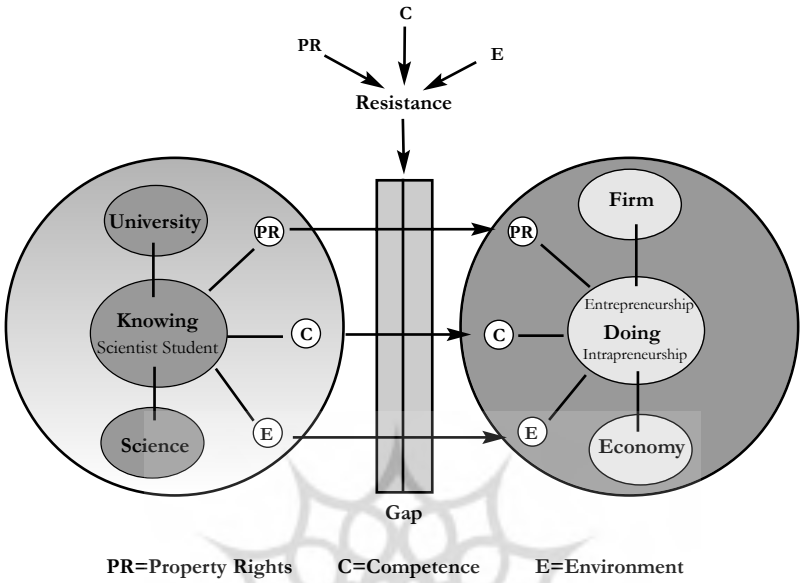

Figure 3: Factors Causing the Knowing-Doing Gap

Science produces knowledge; entrepreneurs create value and new employment with the knowledge. Because the "gap", knowledge is not used by entrepreneurs, it remains "idle", "dead" or "slow" (tragic). The structural coupling between science and the economic systems remains deficient (to stress again, this is not a difficulty of knowledge-frontier societies; it permeates all systems independent of their level of development).

As mentioned, there are two ways out: knowledge/transfer management and entrepreneurship: Those who are in the know do not mutate into doers because they lack the

- **rights** (to do so),
- **competencies** (capabilities),
- **motivation** (will, energy) to engage in innovation (making new things happen).

If any of these three conditions do not exist, entrepreneu rial activity will be on hold or turn to zero and the knowing-doing gap becomes reproduced. Pfeffer & Sutton and other management writers do not give us a systematic account of the causes and the way out of the "gap"

(which obviously does prevent them from making a lot of money with their idea; at least they have bridged for themselves the gap between knowing and doing).

How knowledge is connected with the basic entrepreneurial equation **Entrepreneurial action = f (rights, competencies, motivation)?**

Within the society of a developing nation, we are confronted with the same difficulties. How we get the knowledge and qualifications taught and acquired in institutions of higher learning into the productive economy? How many academics are idling around, are driving taxis, are selling vegetables or cooking meals for sale? They are either unable to bring their (academic) knowledge and qualifications into the market, or nobody is willing to engage them for work which uses their academic qualifications. In both cases, we are confronted with the same diagnosis: lack of entrepreneurial activity.

This situation is more common than we may think. **It is the normal and natural situation.** A university remains an oasis within the region in which it operates. Weak knowledge and competence linkages between a university and the regional economy abound.

And this really goes to the very heart of modern society, which is increasingly based on scientific insight and knowledge (figure 1).

Research without action is daydreaming, action without research is nightmare.

3. The Humboldt-Problem and Schumpeter's Solution

To know something and to make productive use of it are different things. This holds for both explicit and implicit knowledge. To make use of knowledge, we need people willing and able to use it and are endowed with the right to use: Motivation, competence, property rights.

In his groundbreaking Theory of Economic Development, Schumpeter (1911; 1934) explained the innovation process in an economy by the actions of creative entrepreneurs and the impact they have on the course and dynamics of development. Entrepreneurs are defined through their function of realizing "new combinations innovations in the economic sphere. "

How do we transform theoretical insight into practical action, meaning new products, technologies, practices, that increase economic value

and productivity - the basis of any increase in living standards and reduction of poverty?

Since Wilhelm von Humboldt (1769-1859), the function of a university has been understood as research plus teaching (training), its purpose is the education, research and the dissemination of knowledge. How does what we learn at a university about how the world functions, and what we learn in order acquire higher qualifications, enter the economic system?

The knowing-doing gap we are talking about is illustrated in figure 4. It reflects the ideal type of a Humboldt university: research + teaching. This ideal constellation has turned out to be dysfunctional in a knowledge economy. The gap cannot be bridged.

The following figure 4 shows three autonomously operating "subsystems" of a differentiated society (The logic follows the Luhmann theory of systems.) It reflects therefore more the situation in a developed country such as Germany or Japan. Many LDCs are fast moving into this direction.

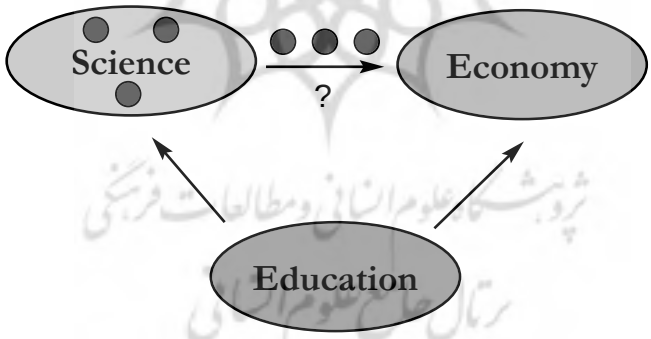

Figure 4: The Knowing - Doing Gap

The three dots represent knowledge incorporated in new ideas. The ideas try to travel into the economy. But they are rejected. Why? Because they are divorced from the people who produce the knowledge and who

may even own it, because they lack in capabilities for implementation and/or because they have insufficient motivation for doing so (figure 3).

The figure actually shows two systemic mismatches: between science and the economy and between education and the economy. The second one is widely being discussed. The education system (schools, universities) does not create what the economy needs. This mismatch is usually framed within an input logic[9]. The inputs needed by the economy do not match the outputs produced by the education system. Since basic innovations of the Kondratieff type (new technological revolutions) require new technical, managerial etc. qualifications, there is a danger, from the input view, that a mismatch develops. The economy faces bottlenecks, structural unemployment results, etc.

Each of the Schumpeter/Kondratieff waves (see figure 1) requires a different qualification profile of manpower (human resources, labor input).

Precisely because each constellation is unique, they will have very different effects in each technological revolution [wave]. The recurrent effect is a pervasive pattern of structural change, but the industries and occupations most affected will be different in each case. Obviously also, the new industries will be quite different. All this means that increased structural unemployment is likely to be a major recurrent feature ... A mismatch of the skill profile is likely to be widespread (Freeman & Louca, 2002, p.338).

The mismatch the two authors describe is indeed a serious problem. But it is not at the center of our contribution. We consider not an input-output-mismatch, but a systemic mismatch between science and economy, which at its heart is an entrepreneurial gap: Those who know do not implement what they know. Actually, a mismatch of the skill profile will only emerge (in the Schumpeter waves of the knowledge society) if there is *no* disparity between knowledge and action of the entre-

9- *Input logic* operates with the hypothesis that it is factor accumulation which drives growth. And that portion of output growth which cannot be accounted for by accumulation is called total factor productivity TFP) or the "residual": unexplained growth. TFP thus captures the "free" growth in output, that is not paid for (accounted by) the costs (the amount and growth) of inputs. Researchers such as Abramovitz, Kendrick and Solow found out, that this residual accounted for approximately 50 percent of the growth in measured output in the early 20th century. Thereafter, a large body of research was going on to explain the residual, often thought as a measure of technological progress, but really 'a measure of our ignorance".

preneurial type between science and economy. If there is a gap, no new wave will materialize, henceforth, a mismatch of the first type becomes a less serious problem. The emergence of any type of intersystemic inputoutput-mismatch, is, in other words, a function of entrepreneurial viability. Entrepreneurship is, as Hirschman (1978, p. 25) has suggested, the ultimate or highest level scarcity. What is different from previous innovation waves in an entrepreneurial knowledge economy, is the deeper *scientific* foundation of entrepreneurship figure1.

Schumpeter leaves no doubt, as to how to overcome the "gap" and how to answer the questions put forward above. Schumpeter's answer is creative entrepreneurship.

Actually, all this is trivial matter. Nevertheless, it has remained a neglected subject, and within mainstream economics, it cannot even be discussed[10]. And with the transformation to a knowledge-based society/ economy, these trivialities suddenly move towards the center of attention.

You may think that the conjectures discussed are really the problems of economically advanced societies. Actually, this is not so. If we compare economies which have prospered (mostly in East Asia) with those stagnating (Africa, Latin America, Middle East), these very problems immediately become obvious.

The "knowledge pool" of the world is available to every nation. Why did some make productive use of it while others continue to live their economic lives with the knowledge of their forebears? Kant and Schumpeter provided early answers.

The Schumpeterian solution to the knowing-doing gap is simple indeed: do what you know or do it yourself. One cannot have an asymetric information problem with oneself[11]. One cannot have a know-

10- Because it is either assumed that every actor in the market is operating with the same level of knowledge, or alternatively, that a pool of knowledge exists, that is available to everybody (knowledge as a public commodity). Recent discussions on information economics have entered more deeply into these fields, but still have difficulty coming up with an entrepreneurial approach. In addition, they fail to differentiate between information and knowledge. In an address given in 1999, former World Bank chief economist, Joseph Stiglitz (2001) has made important points by differentiating between codified and tacit knowledge.

11- This shows, that the Schumpeterian factors of recombination and its causes are theoretically on a deeper level than the information and knowledge asymmetries, with which F.A. Hayek and information economics are occupied with. A person can have mastered his asymmetries, but still run into the difficulty of entrepreneurial acting. Only in the case of routine and arbitrage entrepreneurship, these difficulties do not arise. With innovation, the theoretical book is barely opened, when Stiglitz and Hayek have closed their theoretical book in the believe to have mastered what is worthwhile to master.

ing-doing gap due to difficulties of transferring knowledge. I know what I know[12]. How a science system which follows the Schumpeterian road would look like is sketched in the next section.

Many firms, not to speak of research institutions, are able to come up with new knowledge to create new technologies and products. But they face difficulties as soon as the company's knowledge and skills need to be transformed into competitive advantages in the market. In 1957 Siemens created the first fully transistorized computer in the world.

IBM did not introduce similar computers until 1959. But IBM achieved market leadership, not Siemens. Thomas J. Watson, IBM's former chairman, commented: "We consistently outsold [competitors] because we knew how to put the story before the customer, how to install the machines successfully, and how to hang on to customers once we had them. " In other words: IBM was a better innovator in the Schumpeterian sense. There is another famous case which involved Siemens. This company built the first fax machine. The knowledge underlying the fax technology was protected by patents. Siemens did not bring the machine to the market. It licensed the knowledge away to Japanese firms, which put it to immediate use and built up the fax industry, and by doing so actually destroyed the market Siemens wanted to protect by not innovating herself: the telegraph. There is an old saying about Siemens: "If only Siemens did know what Siemens knows." We would rephrase this saying as:" If only Siemens did what Siemens knew"[13].

12- On a deeper level, difficulties arise also here. Do we really know what we know and do not know. How conscious are we aware of what we know and do not know, and so on.

13- To be fair to Siemens, we should mention, that the German industrial giant is developing a radical program to help overcome or avoid the problems mentioned. Siemens implemented a wideranging management strategy to improve decision-making and boost innovation. For recent developments at Siemens see Marsh (2003). The case of Microsoft is similarly interesting. Paul Abrahams (2003, p. 8) describes the difficulties, to apply the knowledge created by Microsoft researchers within the company. Microsoft tries to provide strong incentives for internal intrapreneurs in order to develop new products based on the insights from internal research.

The function of the entrepreneur

It is not part of his function to, find or, to create new possibilities. They are always present, abundantly accumulated by all sorts of people. Often they are also generally known and being discussed by scientific or literary writers. In other words, there is nothing to discover about them, because they are quite obvious. ... But nobody was in a position to do it. Now, it is this, doing the thing, without which possibilities are dead, of which the (entrepreneur's) function consists (Schumpeter, 1934, p. 88; emphasis added).

Another illustration: In 1979, three European companies- Olympia, Olivetti and Thriumph-Adler - had a three-year lead over their Japanese competitors in electronic typewriter technology. They owned the knowledge and the engineering skills, but they failed to conquer the world market. Some years later, a similar situation arose with video recorders. The Video 2000, developed by Philipps/Grundig was technologically significantly superior to Matsushita's VHS system. Nonetheless, the European firms lost out.

In each case of firm failure, we observe this gap. Managers/entrepreneurs know something, they are aware of difficulties and problems, but they do nothing or not enough[14].

In each case, the Europeans did not handle the Schumpeter problem effectively. They could not translate their knowledge advantage into market success, i.e. realizing "new combinations in the economic sphere."

4. Academic Entrepreneurship and the Entrepreneurial University

The above arguments lead directly to treating the problem of knowledge (produced or available in the system of science) as a"Schumpeterian" or entrepreneurial one. Entrepreneurs have the unique role of being engines that drive economic and social development. They are change agents who may destroy the existing order. They are doers, they

14- Ignoring change: "Motorola and other companies ... such as Rubbermaid, Wang Labs and General Motors were fully aware of how the market was shifting but chose not to do anything about it" (Finkelstein, 2003, p. 9).

overcome the knowledge-doing gap, they put other agents together to create something distinctly different. What is the basis of their competitive advantage?

If their knowledge and skills could easily by transferred, taken up and used by other companies, there would be no need to worry about the problems of structural coupling between science and the economy. We would be more or less in a "neoclassical" world. Knowledge and skills created in the science system would be available as a public commodity, more or less, for the fabrication of Schumpeter goods in the economy. The other side of the same coin is the Humboldt University. We discussed at length why neither view harmonizes with the requirements of an entrepreneurial knowledge economy.

Fortunately, the very difficulties, barriers to diffusion and knowledge gaps assumed as non-existent in the traditional paradigm, create the incentives and opportunities for those owning non-transferable knowledge and skills and thus open up the economic space for academic entrepreneurs.

These are precisely difficulties in transferring an organization's (university's, science system's) knowledge base, as it is embedded in its staff (tacit knowledge) or in competence gaps, that constitutes a basis for the competitive advantage of academic entrepreneurs. Non-transfer ("market failure" for knowledge) is the basis for competitive advantage. Asymmetric information is the way for innovation success.

This result seems paradoxical only within the framework of equilibrium economics, to which information economics belongs. Within this paradigm, information and knowledge, which destroy equilibrium (optimal allocation), is theoretically ruled out. The same holds for those agents who account for the creation of new knowledge, uncertainty and recombinations.

If we enter deeper levels of theoretical territory, the paradox disappears with the theoretical flatland. Non-transparency and so-called information failures turn into action parameters for innovative entrepreneurs. This requires, evidently, on the theoretical and conceptual level, a paradigm shift, and on the institutional level the evolution of a concept of a university beyond the Humboldt functional constraints

and property rights and ethical restrictions.

To answer why knowledge production per se often does not pay economically requires delivering into problems discussed in our paper. It is a matter of the structural coupling between science, economy and the education system. Low returns to research (and development) are due to a lack of entrepreneurial skills (competencies), their regulation, the environment and the challenges, with which entrepreneurs are confronted with (competition, taxes and so on; see figure 3).

In other words: knowledge is available; problems emerge when basic knowledge needs to be transformed into innovation: the knowledge-doing gap.

The same can be said for education and training. If the output of the education system does not become part of the innovation system, resources for education etc. are, economically speaking, wasted. This result is actually drawn by Wolf (2002).[15]

In other words: putting more resources (inputs) into the system, does not on its own result in growth and rising living standards[16]. The (additional) resources need to be recombined creatively. This requires a theoretical and policy mutation from an input logic to a development or entrepreneurial logic.

In this sense, we can talk of an entrepreneurial university. An entrepreneurial university has the capacity to put the competencies and knowledge of its staff (teachers, researchers) and students into action. The knowledge does not only circulate via publishing and talking (to each other and to students), but becomes implemented by entrepreneurial action outside the academic community.

15- For theoretical and empirical underpinning of this view see besides the writing of the author (especially Röpke, 2002a, chapter 3; Röpke, 2002b for China) the work of Aßmann (2003) which also contains a chapter on the university system in a regional context. In addition to the empirical material cited by the above authors, see the contribution of Hanushek (2003). He shows empirically for input-based schooling policies what Aßmann and Röpke, following Schumpeter's lead, derive for the science and higher education system. If we think about education of entrepreneurs themselves, especially the education and training of scientists for innovative entrepreneurship, the challenges the education system faces become even more formidable (see Röpke & Xia, 2006).

16- We are interested in the long run. In the short run, things are different.

The Entrepreneurial University: Five Meanings

An entrepreneurial university can be conceptualized from various theoretical and practical angles[17]. All are relevant and do not exclude each other. (1) Making the university more entrepreneurial in its traditional role as a producer of science, knowledge, skills and qualifications.

Universities, unfortunately, are one of the most conservative and tradition-bound organizations in the world. Even making the university entrepreneurial in its traditional function requires innovations of a fundamental nature as transforming lecture or faculty oriented teaching into student or learner oriented teaching. (2) The first approach is sometimes mixed up with the goal of better management of resources within universities in the sense of cost controlling, operations management, etc.: The McKinseynisation of the university. But a well-managed university is not the same as an entrepreneurial university in the above sense. The two goals may be in conflict with each other.

Concerning actually practiced university reform, the second approach is what is really done - not least because the masters of the university system (politicians and bureaucrats) somehow believe that this is the approach a private firm takes in becoming competitive and because they believe they will save money with such a reform. (3) The university becomes entrepreneurial by better marketing, sharing and transforming knowledge and competencies (via patents, knowledge transfer, joint research with commercial organizations, and so on). (4) The university turns entrepreneurial by linking up with other subsystems of society, especially the economy via entrepreneurial under-takings of members of the university. It is in this sense that we use the concept of entrepreneurial university in our discussion. The entrepreneurial university in any of the types mentioned should not be equated with a commercial university. It is possible to run an entrepreneurial university on a commercial or noncommercial mission or on a mixture of both.

The distinction between (2) and (4) follows Schumpeter's original reasoning for introducing "entrepreneurship" into economic theory: the distinction between the creation of new value-generating activities (new

17- We have elaborated on this theme previously (see Röpke, 2000; Röpke, 2002a, section 4.6)). We still consider these earlier contributions as valid. What I propose in the present contribution is a special focus on the diversity of knowing and doing in a development context.

opportunities) as opposed to statically maximizing (profits) by appropriating higher rents from an existing opportunity. (5) Sometimes, entrepreneurial is equated with privatizing the university.

To transform a university into a privately owned organization can go hand in hand with the entry of entrepreneurship in one of the four senses mentioned above. Privatization means making the university a "capitalistic" entity more or less run for the interest of its shareholders.

Entrepreneurship can definitely not be equated with the function of the capitalist, as Schumpeter (1911; 1934) has stressed repeatedly.

The two states Schumpeter compares - profits that result from allocating and coordinating activities at a given point in time and with a given technology and the creation of new value-adding activities - can in my view directly be applied to distinguish the approaches (2, in part 3; in part 5) and (4):

"A system - any system, economic or other - that at every given point in time fully utilizes its possibilities to the best advantage may yet in the long run be inferior to a system that does so at no given point in time, because the latter's failure to do so may be a condition for the level or speed of long-run performance" (Schumpeter, 1947, p. 83).

In other words: an entrepreneurial university in the sense discussed in our contribution may require a non-optimization/misallocation of resources. How (2) and (4) can be combined or reconciled has so far not yet been discovered.

The debate on these matters is highly confused, since important distinctions are not drawn. For an example see Glotz (2002), who hopes that somehow, by approaches (1) and (2), an MIT in Germany may emerge. If you do (4), i.e undertake what MIT is doing, the other things would follow naturally.

The main function of a scientist and academic teacher is self-evident.

That the scientist can also be - or even must become, in an *entrepreneurial* knowledge society - an "entrepreneur", an innovator, is considered something strange, or worse - immoral and unethical.

What we observe here seems a contemporary replay of developments of the past. Until very recently, innovation was indeed a dirty word. It had strongly negative connotations from the 16th into the 19th centuries.

An innovator was a troublemaker, a rebel, a subversive[18]. Schumpeter did not use the word in his Theory of Economic Development, first published in German in 1911. Instead of innovation, introduced by him in his Business Cycles, published 1939, he wrote of "new recombination".

A very similar negative connotation seems still in place concerning academic entrepreneurship outside the system of science and education. There are massive legal, regulatory and ethical resistance toward the kind of entrepreneurship we believe is needed to close, even marginally, the knowing-doing gap. If "the law of accelerating returns" (Kurzweil, 200, 2003) is more than science fiction, the conse-quences for the management and regulation of universities and other institutions of higher learning are indeed so fundamental, that countries, who do not jump on board will face the punishment Darwin and Schumpeter dish out for those unwilling to evolve: creative destruction.

As in any kind of entrepreneurship, overcoming resistance will be a normal part of the daily activity of academics venturing into the entrepreneurial field. The innovator who is welcomed with open arms by society has still to be born.

The type of academic entrepreneur we discuss plays a dual role: doing research *and* "transporting" the academic fruits of his research into the economy (or other subsystems of society). He does not transfer. He applies knowledge and competence *outside* the system where it was created to another system where it becomes applied. He acts as a dual-function entrepreneur/intrapreneur.

Our main interest is not in implementing the knowledge as a teacher/scientist within the science/research/university system. Our focus is the implementation of knowledge outside the university, the application of science/knowledge in the economy and the social-political environment of the scientific/teaching institutions in which scientists and teachers work.

Figure 5 illustrates this constellation for a society in which the dynamics of innovation are reproduced through the structural coupling of autonomously operating subsystems as science, politics, economy, etc. In system-theoretic terms, we call such a society an autopoietic innova-

18- See the Oxford English Dictionary for the historical emergence of the meaning of innovation.

tion society. The evolution of such a society necessitates entrepreneurial universities and academic entrepreneurship.

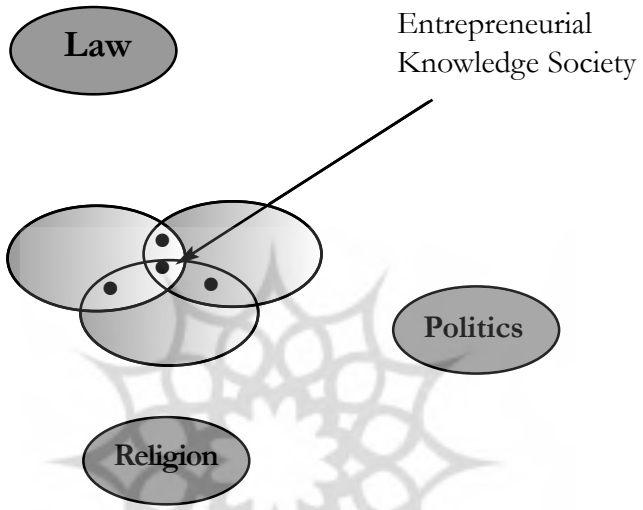

Figure 5: An Entrepreneurial Knowledge Economy

We know a lot about the transfer of knowledge and the problems of transfer between science and the economy. Not so much is known about the difficulties scientists face when taking the knowledge problem into their own hands: acting entrepreneurially. This dimension of the problem is practically absent from public discussion and seldom enters into reform proposals.

There are three challenges figure 3:

- competence challenge (fit between scientific and entrepreneurial competencies);
- regulatory challenge (have scientists the right to engage in entrepreneurial activity - commercially or other - without leaving the university/science system);
- ethical challenge (is entrepreneurial engagement ethically problemati-

cal?[19]).

In quite many a country,[20] putting knowledge into practice by the researcher/teacher himself is often seen as not the task of the scientist cum teacher. It does not fit the Humboldt tradition of the university. The *Verwertung* (application, often commercially) of knowledge is often seen as unethical.

In the USA, the main initiative for university-industry research collaboration and centers originated with universities. This contradicts the corporate manipulation thesis. It supports the argument of Etzkowitz (1999) that "entrepreneurism" has permeated US universities. There are indeed worlds apart between the USA and Europe concerning the incentives for academic entrepreneurship (Henrekson & Rosenberg, 2000).

The US is surely ahead of Sweden (and Continental Europe, Japan) in tackling the "gap". But she offers no smooth sailing for academic entrepreneurs. Conflict of interest is seen as a big problem. The person directing the Technology Licensing Office at MIT has this to say about how start-ups are handled by university regulators:

... We have drawn a Chinese wall between the start-up company and the university. We do not take a seat on the board, we do not let the company sponsor research coming out of the lab, and we do not do any confidential work (Nelsen, n.d., p.284).

At least, it seems, some ideas generated in science (the university) make it into the economy (or other subsystems of society). Economy, science and training/education overlap or fit (figure 5). This does not mean that science becomes dictated / manipulated by economic goals.

It means that the knowledge and competence in science can be applied in the economic system. The central question is: by whom? Our answer: by those, who have created the knowledge, have the ability to put their own knowledge into practice.

To repeat: The focus of the paper is implementation, use, or application of the academics' knowledge, expertise, and capabilities in the cre-

19- This kind of challenge has been pronounced, where ever scientists become engaged into transferring knowledge into economic value without leaving the university campus. They were as pronounced at research universities in the United States a generation ago as they are today in countries like France or Germany.

20- Practically the whole of continental Europe, Japan, to some degree even the U.S., which has travelled the most on the road to an entrepreneurial university.

ation of value and improvement of people's well-being outside the science/education system.

There is one big difference between so-called developed countries and the developing world concerning the knowing-doing gap, and this difference may handicap those of us trained in a country like Germany. Without strong and vital entrepreneurship there is no economic hope for developing countries. Germany and other rich countries could (theoretically) live happily with the living standard and quality of life already achieved.[21] In less developed countries, this is obviously not the case. This being so, makes the interaction of universities with their economic and political environment so much more crucial and makes the promotion of entrepreneurship (private, state, forprofit, community-oriented, etc.) a cardinal, if not the, feature of any development strategy. In other words: as the function of universities and similar institutions in developing nations becomes more vital, the model that alumni bring with them from Western nations and Japan concerning the ideal university (the Humboldt vision) may actually be more prob-lematical.

The scientific world is brimming with giants of knowledge and dwarfs of implementation. If university people do not engage as cultural and economic promoters outside their home turf, substantial opportunities for the improvement of society are missed and valuable opportunities for self-improvement (also in the traditional role as teachers etc.) are disregarded.

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21- If we believe research on the connection between the level of happiness and the level of material wealth (Ryan & Deci, 2001), a lot of what is going on in developed countries seems actually to reduce the level of happiness. To increase their material welfare, people in rich countries engage in actions and follow lifestyles, which reduce their emotional and physical well-being. Money and material wealth, beyond a rather low level, does not appear to be a reliable way to either happiness or well-being.

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