1 Introduction

Starting the own business is sometimes a dream sometimes a nightmare but undoubtedly from a macro-economic perspective it is considered to be a promising concept to secure long-term economic growth and society’s welfare, at least in Germany. Strong efforts were made to support start ups and potential entrepreneurs to run their own business. A plethora of programs were launched which were supposed to facilitate the start up process – but reality is disenchanting: The published data in the 2004 GEM indicate that the idea of an entrepreneurial society in Germany is still far beyond its realization. Germany ranks 17th out of 31 GEM states in terms of “nascent entrepreneurs” and only 22nd regarding the “young entrepreneurs”. Compared to other GEM countries the German adults are considered to be more pessimistic in terms of entrepreneurial issues: The chances of establishing a successful business are evaluated lower than the years before. On the other hand the context factors which are considered to influence the start up opportunities especially in terms of governmental support and physical infrastructure were evaluated to be one of the best. Especially concerning the latter aspect strong efforts have been made to support
entrepreneurs. In this context, and maybe because of

- A “… post-1970s fascination with ‘high-tech’ regions worldwide”
  
  (Cooke/Leydesdorff 2006: 9),
- A continuous liberalization of the world market and its impact on national production systems (which is well discussed in the context of the conversion of cooperatives), or
- The dawn of the concept of national innovations systems (e.g. Lundvall 1988; Cozzens et al. 1990),

For more than two decades, one promising concept of sustaining entrepreneurs was seen in the idea of incubators\(^1\) which mainly offer support in terms of infrastructure and funding opportunities.

Meantime, we observe that questions emerge of how effective and efficient incubators work as one major instrument of macroentrepreneurial (Van de Veen 1995, Chiles/Meyer 2001) activities in order to facilitate start ups and to support the first steps of a new business from its start to its growth.

The value of the incubator model as an effective means of technology and knowledge transfer especially from universities is continually discussed and questioned (Cunningham 1999). For example, a study run by Allen and Kahman (1985) concluded that incubators are tools for developing enterprises which create a positive environment for small businesses to succeed. Indeed, lots of studies brought up that incubators are an efficient and effective way to sustain spin-out processes and to contribute to regional development and prosperity. However, on the other hand some shortcomings are obvious: Finer and Holberton (2000) take into question the incubator model because it takes the initiative away from the start-up team.

The paper refers to these observations. We assume by means of some international empirical studies that the functions of incubators are enhanced as a result of a (evolutional) learning process. On this basis we derive hypothesis about the dealing with the upcoming challenges and provide further research questions in an explorative way. Paragraph 2 introduces a three phased model of business incubators and classifies existing incubators. It will be obvious, that there is an increasing amount of functions that are allocated by incubators. Within paragraph 3 we examine recent developments from a macroeconomic perspective and contrast to this the evolution of incubators. Paragraph 4 presents two types of incubators that take these

\(^1\) In the context of this paper we primarily refer to non-profit incubators.
contradictions into account and offers an alternative coping. Summarizing, we give an outlook on further research questions which will substantiate the evolutionary perspective on incubators.

2 Evolutionary Insights in the Development of Incubators

“Attempts have been made to classify incubator types (…). This is not as easy as it sounds” (Bollingtoft/Ulhoi 2005: 270): By following an evolutionary perspective Arnoudt (2004) discusses national specifics of the different national incubator concepts and finally aggregates these to some kind of mixed typology: Based on this approach some categories are determined by the member-structure of an incubator, namely mixed incubators providing “… services to all kinds of enterprises from low-tech, to no-tech, including manufacturing and services” (Arnoudt 2004: 128). Some other categories concentrate on the incubators function to either its members (e.g. social incubators) or to its regional environment (e.g. economic development incubators).

Based on a survey of nearly 170 business incubators focussing on the service needs of their members Hansen et al. (2000) presented the networked incubator as a milestone in the evolution of incubators: Unlike conventional incubators with average performance these networked ones not only manage a basically material infrastructure like bureaus and information technology slightly jacketed by some basic immaterial services. They also offer to their members a social infrastructure of potential cooperation partner with regard to actual or future project. This seems to reflect to a situation that has been lined out as follows: “While entrepreneurs wanted high levels of expertise and capital, a majority of the incubators focused on infrastructure or simply failed to deliver the services they had promised” (Peters et al. 2004: 85).

Later on, Gibson and Wiggins (2003) identified five tasks a successful incubator has to moderate: (1) establish clear metrics for success, (2) provide entrepreneurial leadership, (3) provide value-added services to member companies, (4) develop adequate selection processes, and (5) guarantee that members get access to necessary resources. This task-orientation indicates both a tendency of growing expectations incubators have to comply by providing increasingly more services and the growing interest in the development of indicators for some kind of incubator competence. For reasons we will discuss in chapter 3, indicators of the
performance of incubators become increasingly relevant as the concept itself gets more and more challenged.

As suggested by Peters et al. (2004), one of these indicators can be the number of “graduates” that successfully “absolve” an incubator. According to their qualitative research on 49 incubators the dimensions physical infrastructure, coaching and networking\(^2\) seem to be three major factors that affect the number of graduates. By identifying physical resources, competencies and market access as basic categories of (disappointed) entrepreneurial needs (Lyons 2002: 202), research on typical entrepreneurship obstacles positively cross-evaluates these findings. Taking all of these empirical findings into account we now generalize them in terms of social systems theory by means of some fruitful distinctions: First, we can think of incubators as distinct systems with their distinct environments. Second, we combine this perspective with one of the most universal distinctions drawn by Luhmann (1987: 16f) as he claimed physical systems\(^3\), psychic and social systems to be incommensurable levels of analysis. Keeping both of this in mind as the commonplace of the in-transformability of substances in thoughts in communication (and v.v.), we can state that an incubator has to deal with three fundamentally different dimensions of environment. From this point of view we can now assume that an incubator

1) Is confronted with physical, psychic and social sequences of events taking place in its environment.

2) Refers to these events in terms of physical, psychic and social forms of resources.

3) Is transforming these resources – by means of physical, psychic and social competence – into forms of economic, cultural and social capital.

4) Finally accounts these forms of capital according to a certain innovative function.

We justify this walk over paradigms by referring to an invitation “… to draw upon the resource-based view, organizational learning, and social networks literature (…) [as] a multi-model approach is necessary since each model provides us with an explanation about the characteristics of the incubator services” (Peters et al. 2004: 88).

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\(^2\) With these dimensions being defined as follows: “The physical infrastructure includes rental spaces, equipments, administrative facilities like fax, phone, internet lines, in certain cases labs, conference facilities and so on. Coaching (…) is described as training and educational workshops offered. Seminars or programs offered either for a fee or free of charge to the tenants of the incubators. Networking (…) is described as the access available to the tenants of the incubator to managers, administrative, management, financial, legal, insurance consultants as well as to scientists, academicians, prospective customers, either for a fee or free of charge” (Peters et al. 2004: 86).

\(^3\) To be more precise: substances (instead of “machines” in: Luhmann 1987: 16), organisms, psychic systems and social systems.
In the context of *multi-model-approaching* the social systems theory (Luhmann 1987, 1997) provides an adequate framework for supporting the modelling of *both* an universal *and* a selective typology of incubators. In this sense we suggest to conceptualize the development of incubators as following evolutionary patterns in a way as several distinctive functions are added depending on specific environments an incubator faces. The term “evolutionary” herein not refers to a biological understanding of selection, variation, and retention processes which happen more or less randomly. We rather draw on an evolutionary perspective on social systems in which both random *and* rational moments occur in these processes (Göbel 1998: 129).

As a consequence of drawing on systems theory as a theoretical framework for modelling a typology of incubators we suggest to not longer focus neither on concrete needs of member companies nor on selected services but. Instead, we focus on incubators as “triple helix in nucleo” (Etzkowitz 2002: 17) and on the functions their services have for their members, for other systems in the environment as lined out by the model of triple-helix embeddedness and finally for the incubator “themselves” (the latter aspect will be discussed in chapter 4). Thus, generalizing the findings of Lyons (2002) and Peters et al. (2004) we now differentiate between *physic, psychic and social functions* which an incubator has to maintain to either be kept alive or to be able to keep alive by own means – maybe according to a plan of implementing incubators that “… would become financially self-sustainable after 11 years” (Lazarowich/Wojciechowski 2002: 24). The major implication of this functional analysis is that it puts any relations between any kind of events in terms of problem and solution (cf. Luhmann 1987: 84). Hence, we interpret functions as more or less condensed problem solving expectations at distinguishable levels of analysis. That, on the one hand, may lead to the perspective of a functionally differentiated society and finally to new constellations of problems lined out by Luhmann (1997: 707ff, 756f) or in the context of the triple-helix models mentioned above. However, by focussing this functional perspective, on the other hand we gain a consistent theoretical concept allowing us to compare the fundamentally different in terms of functional equivalence (cf. Luhmann 1987: 83). Therefore, as a first step towards a systemic informed typology of incubators,

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*The major implication of this functional analysis is that it puts any relations between any kind of events in terms of problem and solution (cf. Luhmann 1987: 84). Hence, we interpret functions expectations at distinguishable levels of aggregation/analysis. That, on the one, may lead to the perspective of a functionally differentiated society and finally to new constellations of problems sketched by Luhmann (1997: 707ff, 756f) or in the context of the triple-helix models mentioned above. But by focussing this functional perspective, on the other hand we gain a consistent theoretical concept allowing to comprehend that the fundamentally different to be still comparable in terms of functional aequivalence (Luhmann 1987: 83)*
1) On a thirst level of analysis we observe that an incubator has to somehow match the expectations concerning its physic function. On this very basic level of observation we may find that incubators have to manage substances (and organisms) concentrated to a certain spatial spot. If we try to imagine an incubator solely arranging physical persons towards a physical infrastructure mainly consisting of office space, information technology, energy and maybe working materials, we speak of an physical incubator in best literal sense. Physic incubators operate functions on spatial, physical problems. As can be shown by the former image of incubators of being hardly more than “academic concierges” (Prof. Tischendorf, Managing Director of the incubator Technologie Centrum Chemnitz) or by the research of Hansen et al. (2000), this ideal type still has got some empirical relevance.

2) On a second level we may speak of a similar ideally type of incubator called psychical incubator. Its major objective is to provide ideally all functions concerning the physically needs and the psyche of the members. From this point of view we have to deal with problems of emotion, knowledge and competence that can be solved by means of coaching, teaching and training (cf. Lyons 2002, Peters et al. 2004).

3) On a third level we can observe social functions of an incubator dealing with the problem of providing services concerning – to name the most common forms – economic, cultural and social capital (cf. Bourdieu 1987, Coleman 1990, Putnam 2000, Burt 2001). Hence, if an incubator is able to fulfil physically, psychic and the capital based function(s), we can speak of the type of a social incubators: All of these forms of capital base on conventions, meaning that this capital has an immaterial, communicative shape. This is easiest to be seen with regard to social capital (trust) and hardest, as a matter of habit, with respect to economic capital – e.g. Lyons (1996: 202) may have thought as a numismatist when claiming money (and venture capital) to be a physical resource.

Following this approach, longitudinal incubator-analysis might show at higher resolution that a basic tendency in the evolution of the concept of incubators is the taking-up of more and more, and more and more intangible (configurations of) functions that are hardly to copy by competitors.

Of course, all observable kinds of incubators – even the academic concierge – will realize at least some factors of each of these three basic functions. Hence, we suggest to no longer categorizing incubators according to the question, which specific tasks (cf. Gibson/Wiggins...
or services (cf. Peters et al. 2004) an incubator is able to realize or to provide. Instead, we propose to rank incubators by asking up to what percentage a given incubator realizes physical, psychical or social functions at a time. By this means, we can go on to distinguish the incubator types mentioned above as specific sets of functions (cf. figure 1):

Thus, both venture capital incubators (cf. Chandra/Srivastav/Shah 2003: 93) and networked incubators (Hansen et al. 2000) can be seen as two specific forms of a social incubator. Or rather: As two different foci on one and the same phenomenon, as we may also find social incubators combining both functions in an appreciable way. We also may stress that psychical incubators may vary concerning their specific combination of coaching, teaching and training functions while still staying psychical incubators. Analogous with physical incubators (high-tech, low-tech?) …

We think, this functional and, thus, relational view will sooner or later provide us with an perspective that allows to systemize sets of indicators by which specific types of incubators can both be identified or measured regarding to their performance and be chosen in view of specific economic, scientific or political constellations of interests.

All of these aspects have to be taken into account as the concept of the business incubator is challenged by profound change in the balance of powers defining the function of an incubator as described by the model of triple-helix-embeddedness or for reasons that will be discussed in the next chapter.
3 Upcoming Commercial Challenges on Incubators

In Germany, the development of the incubator concept is highly connected with issues concerning the regional development and public financial support. Incubators should fulfill expectations of a wide societal extent (Etzkowitz 1998). The incubator concept is an expression of the capitalisation of knowledge and takes place as a profound normative change in science: It is an “interplay of cognitive opportunities, institutional arrangements, and normative change and that this in turn has cognitive effects on future research agendas” (Etzkowitz 1998, 824). Even if the concept is meanwhile very controversial in its empirical basis, Gibbons et al. (1994) and Nowotny et al. (2005) described these changes by the so-called MODE2 of Science.

In this context, an outstanding buffer function between science and economy is meanwhile attributed to the incubator concept. Academic research now increasingly orientates in industrial progress and public economic development policy. Industrial conurbations around universities, supported by government research funding, has become an important fact in national development programs of specific regions. The thesis of a triple helix of academic-industry-government relations encompass observations such as the importance of new organizational mechanism like incubators that become a source of economic activity, community formation, and international exchange. Regions get the chance to absorb knowledge sources into the political economy; incubators can be utilized both to adapt technologies to solve local problems as well as to transfer local innovations abroad (Etzkowitz 2002). The business incubator became an instrument to promote a more diversified base for regional economies, regional job creation and later on a tool for improving regional competitiveness by fostering the emergence of technology-based firms (Clarysse et al. 2005).

In Germany for instance, the University of Berlin established the first incubator in 1983, aimed at facilitating the transfer of research findings to industry. The Association of Technology and Business incubator centre estimates that today there are over 300 innovation

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5 A brief history of the international diffusion of business incubators is presented by Arnoudt (2004); With the oldest incubator being established in 1950, this ranking sees the USA first. In 1975, the first incubator took up work in the UK, followed by India in 1980 (cf. Chandra/Srivastav/Shah 2003), Germany in 1983, France in 1985.
centres in Germany. Business incubation centres support around 1000 start-ups a year and the average incubation period is between 3 and 7 years (Aernoudt 2004).

All these deliberations contribute to a picture of the incubator concept as a success story: once an incubator is installed the effectiveness of the project is guaranteed. However, there are a few studies that disturb the picture in some degree. For instance, Aernoudt investigates Business Innovation Centres (BICs) that were called into being by the European Union in 1984. BICs are organizations supporting technology transfer and providing services in the form of incubators. Aernoudt assesses the situation of these incubators as rather unconvincing: a “BIC is hardly more than a high technology version of a managed workshop, stated the Financial Times. Technology parks, in which they are often housed, are no more than pleasantly designed industrial estates, usually with an elegant pavilion style for most of buildings” (Aernoudt 2004, 131).

An enterprise panel based in the United Kingdom concluded that BICs lost impetus after losing the initial EU funding (Aernoudt 2004). In the USA in 1981, there were eight incubators and by 2000 there were 900. That is over 9,900% growth in the number of incubators. As Peters et al. state it would be easy to presume that the role of the incubators in enabling the entrepreneurial process has been a success. But a closer look reveals that between 2000 and 2003 the number of incubators has actually dropped from 900 to 600 (Peters et al. 2004).

This raises the question, “by providing resources that reduce transaction costs have incubators helped the entrepreneurial process” (Peters et al. 2004, 83) or do they actually diminish “the friction in transactions” (Etzkowitz 2003, 118)? Beside the challenge of measuring, there is less empirical information about the effects of incubators in a specific regional setting (Etzkowitz 1995). Recent analyses refer to some individual successes but states that there is little conclusive proof of its value added or cost effectiveness. However, it is obvious, incubators are not effective in general and incubator managers do underscore that they must mature and develop capabilities as stated before: “while entrepreneurs wanted high levels of expertise and capital, a majority of the incubators focused on infrastructure or simply failed to deliver the services they had promised” (Peters et al. 2004, 85).

Moreover, it is conspicuous on the one hand that issues about the role of the state and private investors are placed on the agenda, given the various uncertainties in the strategies and the corresponding risks in the investments. After a period of rapid growth of structures at the different interfaces (e.g. incubators, transfer agencies, university-industry collaborations) a
tendency to leave selection to the market can be observed (Etzkowitz 1995). This process is linked with the re-integration of public services into the private sector and leads to cost and risk reducing new organizational arrangements as a result of deregulated areas (Theurl 2004).

On the other hand, the breakdown of incubators is obvious in countries where the public financial support is small or does not exist and where incubators are profit-driven. Referring to the concept in the USA and the United Kingdom, incubators are profit-driven (Aernoudt 2004) and can fail as stated above. In Germany, incubators should support regional economic development contributing to the revitalization of neglected areas, should help unemployed people foster entrepreneurship, and promote the transfer of technology. Due to their exclusive public mission, the incubators are non-profit centres (Aernoudt 2004). Thus, the German incubator concept is not market-driven, so that the continuity of an incubator is not necessarily connected to their economic survival. Due to the absence of market regulation, the real public effects on regional development are difficult and only indirect to measure.

The role of state and the success and fall of incubators is underexposed in literature so far. Against the background of the retreat of public authorities in many field and the corresponding current developments in other countries there is to investigate in a German background:

- To which extent do incubators support economic development in specific regions at all?
- Do incubators only fulfil their societal-economic role in a public financed background?
- Or vice versa: does public financing of incubators impede the efficiency of incubators or even the dealing with a suitable role in supporting start up’s and spin off’s?

Certainly, within this paper with an explorative purpose we will not be able to answer these questions. However, within the next chapter we present experiences with other types of incubators coping alternatively with these challenges that will face the incubators in Germany in the near future as well. This goes beyond the evolution of changing incubator functions in Germany (as mentioned in paragraph 2) but will influence its concept and appearance crucially.

4 Facing the challenges - Towards Generative Incubators

This shift from politics to economy can be observed globally, accompanied by the development of more and more self-organized structures of cooperation. The question arises
of how incubators can deal with those changes and challenges. Having a closer look on the
development of incubators we can observe as stated in the previous chapters that incubators
follow in their development some kind of evolutionary path. It seems to us that they follow a
patterned process in a way that beginning with the type 1 incubator steadily more and more
functions are adhered to incubators.
Empirically we already can observe the dawn of next step in the evolution of incubators
which we call the “Self-organized incubator” or, following our typology, the type 4 incubator.
Self-organization in this context not only means that an incubator has the capability to cope
successful with its own inner complexity, but that it is able to do this under conditions of
lowering funds and, in general, less embedding adjustment policy. This is what we expect
would be or needs to be the immediate reaction incubators and politicians need to consider
acting adequately in this new context. We would like to contrast this development by an
example which originally nothing has do to with the concept of incubator but which is in turn
a good example what organizations do facing such new conditions. The history of the New
Zealand Diary Board (as well as its precursors) and the Fonterra Co-operative Group Ltd. is a
concrete example for this evolution of self-organization, as the NZDB – once being
implemented by the government and providing functions equivalent to those of an incubator –
finally was taken over by the members of the farmer-entrepreneurs it was built to serve (cf.
Roth 2005).
What are some basic characteristics describing the fourth type of incubators deriving from an
evolutionary perspective? Firstly, those incubators are able to diversify their funding sources.
Public funds are not the dominant opportunity anymore to raise financial resources in order to
sustain the incubators business. Rather market driven opportunities gain more and more
importance like selling services, products technologies etc. Secondly, such a development
leads to more independence from associates which are mostly public institutions. Customer
orientation is steadily becoming the leading paradigm in all action underway in the incubator
organization. Earning money instead of administrating budgets makes it possible to build
appropriate reserves and letting the business grow. A market orientated paradigm leading the
incubators activities offers the opportunity to reward the incubators staff according to theirs
personal performance. Currently, incubators reward their employees salary-based because of
regulations deriving from theirs status as being mostly public owned. The market performance
of the type 4 incubator builds therefore a good measure for its performance evaluation. And
last but not least it is stated that market mechanism is a better driving force for organizing a
business than hierarchy. (Wolfmeyer 2003)
The turn from the type 3 incubator the Networked incubator towards a self-organized institution seems to become at least from the present point of view an endeavor, a complex problem with heterogeneous dimension to deal with. Firstly, and this is perhaps the most striking problem the influence from public agencies decreases down to a minimum comparable to regular businesses. The question arises if those agencies are able and willed to make this turn. Besides of this basic and indeed political question some technical problems arise. One of these problems comes with the inner organizational shift in thinking and acting in budgets (cameralistics) towards acting in management systems based on market principles. Installing those principle need to be accompanied by a fully draw back of governmental agencies. Otherwise some form of “dirty competition” may occur in terms of participation of governmental agencies in market competition. The Management of the fourth type incubator needs to gain other competencies in order to do their job adequately. It makes a difference to administrate an incubator or to run a business. E. g. managers need to be able to acquaint new clients. Finally, the incubators are pictured in a specific way by some of its stake holders. Such a shift could lead to some image problems in a way that clients still picture those incubators as a “Förderbude”, which in turn could cause not figuring these incubators as being competent and reliable business partners.

From our point of view the turn from the still mainly governmental funded and driven incubators towards a type of incubator which itself can be described as starting a new (ad)venture or business is a possible and probable way to deal with upcoming challenges. Such a step would also contain the great chance for incubators to actively contribute to regional welfare in a way that not only single spin offs in these incubators create new jobs but also the incubator organization will do so.

Suggesting that such a development could become real and legal provisions are changed in that way obviously a further evolutionary step becomes a logic consequence which is what we call the type 5 or “generative incubator”.

We would now like to ask if we can imagine how these self-organized incubators can develop in what we call “Generative Incubators”: complex, self-organized systems not only being capable of collective self-sustainment in the sense of executing costumer orders but also of generating innovative ideas. As being home for several single new ventures mostly with new technologies right on the edge of general technological development incubators build institutions in which a lot of often complementary knowledge and technological resources are available. By having the opportunity to allocate these resources to realize profits incubators would from our point of view not just a promoter for new ideas and innovations they would
rather act as an innovating motor themselves. We would identify the following characteristics describing the fifth type incubator. By clustering their in-house competencies, selecting and bundling already given and new competencies orientated at market needs Generative incubators would firstly generate unique characteristics. Their business activities would be highly encouraged and driven by endogenous potentials which would be regularly up-dated by new ventures entering the incubator. Because of the fluctuation rate in incubators which stems from restrictions to be home for new ventures just for several years these incubators would be very flexible and always right on the edge of technological development. Such incubators would generate competitive advantages which make it possible to compete successfully not just on regional markets.

Generative incubators are offering the opportunity to lower public funding and create economic welfare. Hence, we would like to point out that some threads arise concerning this type of incubators. Incubators are established to support new businesses mostly with some certain technology which is seen to generate sustainable benefit for a region in terms of economic welfare and prosperity and which is seen to be future-orientated in general. For the single new venture it often is a very good chance to start a new business relatively comfortably and risk minimizing. Which of the new venture can be part of the game and which is excluded needs to be decided in an adequate manner. What would be caused if and when politics’ draws back and looses its regulatory function? How do legitimating and decision making structures look like after the politics’ draw back? Incubators are responsible for their (autonomous) new businesses they support. But who decides and how is decided which customer orders are executed and which not and which of the new businesses within the incubator will participate? These questions deal with problems of equity and transparency of entrepreneurial decisions of the incubator.

As a result, the questions of how effective and efficient incubators work in order to facilitate start ups and to further entrepreneurial skills shall and can now refer to a set of three historically grown and two rather prognosticated categories of expectations incubators have to deal with. Finally we suppose, that incubators being able to operate as Self-organized or even Generative Incubators will have – mostly based on intangibles – competitive advantages compared to the other three “classical” types mentioned earlier. Thus, we also may speak of self-organization as a possible forth basic function an incubator has to fulfill, at least in future. Of course, present types of incubators (1-3) already realize self-organization to some extend. But, due to their external funding these incubators are not free to decide which specific function they like to fulfill by means of what kind of structural configuration as lined out in
chapter 2. Their function is more or less exclusively determined by specific arrangements between the parties concerned in the specific triple-helix-configuration the incubators are embedded in. Type 4 and 5 incubators increasingly gain this freedom resp. competence, as it could be shown by drawing the evolutionary process of incubator development and in contrasting this process with empirical data from Fonterra case studies. We suggest to learn from this and similar processes for to gain a profounder understanding of what a sustainable support of incubators in the context of lowered government subsidies could be.

5 Conclusions and Research Implications

“Innovation can be considered as the reflexive recombination at an interface, such as between a technological option and a market perspective” (Cooke/Leydesdorff 2006: 31).

Since the 1950s, incubators as one rather de-central form of such an interface replaced concepts of national innovation systems. Today, incubators are challenged themselves, not primarily by alternative concepts but by profound change in the environment they formerly were embedded in: A former balance of powers in the triple helix of science, politics and economy currently shifts, which causes effects shown by the MODE2-concept or the research on the financing structure of incubators between 1984 and 2001 performed by ZENIT.

If not fact already, incubators soon will have to re-adopt to a new environmental setting which is challenging them to legitimize their own work either by complying certain parameters measuring the “organizational competence” of an incubator still funded externally (types 1-3: physical, psychical and social incubator), or by ways of demonstrating this competence themselves. As we concern the latter, we identify two more possible types of incubators – the self-organized incubator and the generative incubator which we expect to vary mostly in their structure because of basically different forms of observation:

1) Increasingly running out of government subsidies, Self-Organized Incubators try to acquire as many orders as they can execute while still being capable to comply certain parameters of prize, time and quality. Regarding self-organized incubators, “… a clearer understanding of what (…) entrepreneurs need in order to be successful must be developed” (Lyons 2002: 197). In concrete terms, this means to identify external – material, psychic and social – resources, competences and capitals needed to bridge
the order specific gap between the own actual capabilities and the actual performance demanded by the market. We expect that self-organized incubators will tend to adopt their internal structure to the needs of the market. Thus, the decisive criteria of member-selection will more and more become competence in the sense of excellence.

However, as *product* and *market life cycles* tend to become shorter, in the long term it might also be a good idea to not only follow the path(-dependenecie)s of functional differentiation by gaining unique selling points by selecting (potential) internal structures and member start-ups according to (anticipated) order specific performance parameters.

2) Hence, another major strategy for an incubator to survive without external funding could also be to focus on its own endogenous potentials by simulating and communicating questions and answers of what kind of product(innovation)s potentially could be realized with the actually given *internal* configuration of resources, competencies and capitals. These *Generative Incubators* provide space, time and strategies for/of self-observation. As, by this means, they may be able to launch push strategies on markets, these incubators get even more independent from external parameters of success. Thus, we expect internal diversity to a degree which enables the generation of core competencies without loosing expertise in adapting the incubator to actual market needs to be the decisive criteria of member-selection.

Both of these concepts are to be seen as two sides of the same medal of *self-sustainability* (cf. Lazarowich/Wojciechowski 2002), hence, as two different perspectives, both with a deep strategic impact on the decision of

a) what the basic physical, psychic and social dimensions of the materials, competences and capitals are and

b) how they need to be configured to make incubators to survive.

By considering self-sustainability as the dominant competence that is to be managed in facing the new challenges for incubators the question arises what are the competencies incubators need to generate manage self-sustainability. This is a question which needs to be applied in further research on incubators.

From a theoretical point of view the paper offers a new typology for categorizing incubators by using an evolutionary perspective which we lined out via describing the incubators type 1 to 3. Evolutionary in this sense means the development of incubators can be described as a
balanced adding and dismissing of functions to serve specific needs. A so conceptualized
typology offers from our point of view the following advantages:

1) Starting with an operative focus we may say that it will now be easier to decide
whether a lack of commitment or trust may indicate either a lack of psychic (e.g.
coaching) or rather indicate a lack of social services like networking. It could also help
to distinguish between knowledge network and the social network of an incubator.
Hence, it will be easier to react adequately on dysfunctional effects, as well.

2) Concerning the structure of incubators we now can think of a selective typology of
incubators based on the analysis of certain performance profiles concerning the
question up to what extend or quota an incubator realizes each of these functions in
form of specific services. This may also be seen as a basic step towards a system of
incubator business ratios.

3) Thus, longitudinal incubator-analysis would show at higher resolution that a basic
tendency in the evolution of the concept of incubators seems to be the taking-up of
more and more, and more and more intangible (components of) functions that are
hardly to copy by competitors. As, at the same time, incubators are confronted with
even more expectations, not only questions on their actual portfolio of services but
general questions on their main function and their basic functionality arise.

Finally, as we outlined two new types of incubators – the self-organized and the generative
incubator – we supposed that general shifts in the relation of politics, economy and science as
debated in the MODE2 discussion become real in a way that the balance in that triple-helix-
model will is about to be adjusted in favor of the economic systems. If our observations can
be validated and these changes come true some other questions arise. Firstly, we need to ask if
we could already present possible and plausible ways of coping with those challenges by
enabling self-organized and generative incubators to work and secondly, and this is probably
the most important question, do such shaped incubators still contribute to an overall social
welfare as the idea of incubators suggested?

References

135.


