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**University and Its Societal Environments:
Reflections on the Triple-helix Model**

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Biographies of the authors

Dr., Docent Juha Tuunainen is a sociologist who works as a university researcher at the Department of Social Research, the University of Helsinki, Finland. His research has covered a range of topics stretching from science and technology studies and higher education research to organizational sociology and innovation studies. Dr. Tuunainen's research topics have included science and technology policy, innovation processes and networks, university organization and commercialization of research results. At present, he is involved in studies that focus on 1) university–society interaction in different disciplines, 2) open innovation practices at university–industry interface and 3) effects of changes in innovation policy on the renewal of university research. In recent years, Dr. Tuunainen has published his work in leading international journals, such as *Social Studies of Science*, *Science, Technology, & Human Values*, *Perspectives on Science*, *Symbolic Interaction*, *Higher Education*, *Science and Public Policy*, and *Management Learning*.

Dr., Docent Kari Kantasalmi works as the Head of Research Affairs at the Faculty of Behavioural Sciences, the University of Helsinki, Finland. In this work, he is deeply engaged in the process of reforming the system of doctoral training at the university and the faculty. Previously, Dr. Kantasalmi has been engaged in research projects and educational cooperation in ethnic inclusion issues in Latin America. His research has focused on inclusive and exclusive transformations in the history of the higher education system. In scientific literature, organisational differentiation of university system has been viewed mostly as consequence of quantitative processes. While focusing on this topic, Dr. Kantasalmi's interest has been directed to different boundary formations. This focus has its motivational basis in sociology of knowledge and sociology of science. In addition to his research, Dr. Kantasalmi has taught courses about evolution of the third mission of the university, societal history of education and schooling as well as comparative education methodology.

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1. Introduction

Universities are important institutions in the current knowledge society. Their role is to provide new scientific and technological knowledge, to educate people to serve the society and to alleviate societal problems of various kinds. Because of their great societal importance, universities have been streamlined to make them more efficient and capable of fulfilling their scientific, economic and social missions (Pelkonen & al. 2010). Universities are thus becoming organizational actors with strategic goals and effective internal management systems (Whitley 2008, Krücken & al. 2009). This has also engendered new forms of governance and steering mechanisms within universities, such as creating a stronger role of central authorities in determining organizational goals and strengthening the role of individual leaders (Bleiklie & Kogan 2007). Supported by major external funding instruments, new initiatives under the rubric of the third mission of the university have also been introduced (Nedeva 2007).

The new societal role of the university is by no means novel in a historical perspective (Geiger 1988). What is new in the current situation is the movement towards an intermingling of science, government, industry and the civil society (Kleinman & Vallas 2006). In the literature, this transformation has given rise to many interpretations that underline the neo-institutional thesis that universities have become isomorphic with other societal organizations and activities (DiMaggio & Powell 1991). These include the Mode-2 knowledge production (Gibbons & al. 1994), triple helix of university-industry-government relations (Etzkowitz 2003a), academic capitalism (Slaughter &

Leslie 1997), entrepreneurial university (Etzkowitz & al. 2000a; b; Clark 1998; Marginson & Con-
sidine 2000) as well as post-academic (Ziman 2000) and post-normal science (Ravetz 1999). Of
these interpretations, the present paper focuses on the triple-helix of university-industry-government
relations and entrepreneurial university.

When compared to other theories mentioned above, triple helix stands out as a central locus of re-
search with nearly 1 400 citations¹ in the SciVerse Scopus bibliographic database on May 30, 2013.
Furthermore, as exemplified by the annual triple-helix conferences, organized since 1996, and the
constant flow of new research inspired by the model, triple helix has gained a strong foothold
among those seeking to understand and manage dynamics that are at play in the intersections of
science, business and society. The contribution of the present paper in this context is to provide a
concise review and commentary of the work done in this important and timely area of study and to
facilitate its further theoretical development. To this end, the current paper, which builds on our
previous study (Tuunainen 2013), will 1) provide a brief summary of the triple-helix model, 2)
characterise it in terms of different types of sociological theories and 3) explore theoretical lines of
thought that appear as promising avenues in developing the model further.

The article is structured is as follows: After summarizing the major viewpoints of the triple-helix
model, we shall discuss the commentary given about it. When doing so, we will suggest that the
theoretical status of the model is ambiguous as it combines elements coming from three major types
of sociological theories, including research theories, general sociological theories and diagnoses of
an era (Noro 2000). After that we will focus our attention on the general theoretical underpinnings
of the triple-helix model, namely Loet Leydesdorff's reading of Luhmann's systems theory and
possibilities offered by neo-institutional theory of organizations, so as to evaluate the potential ave-

¹ We searched for "triple helix" and "Etzkowitz" in all fields in journals published in social sciences and humanities.

nues available for the model's further development. In the concluding part of the paper, we will summarise our main results.

2. Triple Helix of University-Industry-Government Relations

The idea about “the triple helix of university-industry-government relations” was introduced by Etzkowitz (1998) during the mid-1990s. Having emerged from his earlier research on university-industry relations the triple helix is a metaphor that represents the close interaction and increasing overlap between previously separate institutional spheres of the university, industry and government. The basic idea behind the model is simple: it states that in the era of knowledge society, university, industry and government have equal roles in enhancing innovation through more intensive mutual interaction. According to Etzkowitz and others (2007), the triple-helix model comprises three elements:

- 1) a more important role for the university in fostering innovation,
- 2) a movement toward intensive interaction and collaboration between the institutions of university, industry and government, and
- 3) transformation of the conventional functions of the above-mentioned institutions so as to take the role of the other.

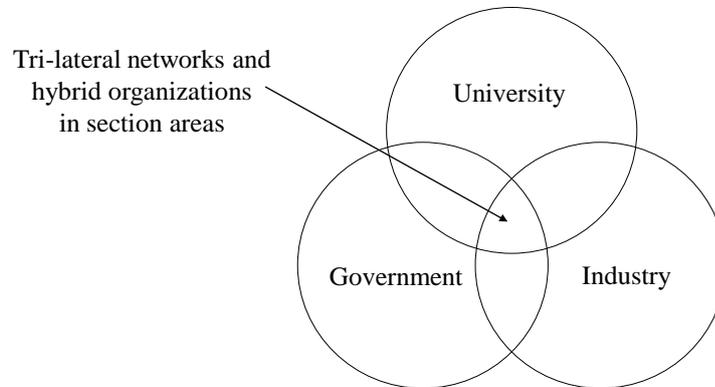


Figure. The triple-helix model (adapted from Etzkowitz 2003a, 302).

In the knowledge society, the central function of the triple helix is to stimulate innovation by new, hybrid forms of organizations and networks located at the section areas of the three helices. According to Etzkowitz and Viale (2010, 596), the whole of society is changing “as public-private dichotomies in knowledge, institutions, organizations and roles evolve from pure-bred to hybrid”. Because different countries have dissimilar histories before entering into the knowledge society, the model takes different configurations in different parts of the world (Etzkowitz & Leydesdorff 2000). Basically, there are three distinct routes to triple helix (Etzkowitz & al. 2007):

The first of them is the statist Triple Helix I, which is found in the former Soviet Union and China. Here, the nation state encompasses the university and industry and directs their mutual relationships through central planning and coordination mechanisms. It is, therefore, the role of the government to pull the other two spheres into collaboration with one another to foster innovation.

The second triple-helix configuration is the *laissez-faire* Triple Helix II exemplified by the United States, Canada and Sweden. It consists of three separate institutional spheres with strong borders and highly circumscribed relations among them. In this variant, each institution has a purpose: the university provides research and educated personnel, the government solves problems that inhibit the proper operation of the free market and the industry turns scientific inventions into commercial innovations in a competitive market place.

Finally, the third variant of the model, called the interactive Triple Helix III, denotes a knowledge infrastructure made up of overlapping, yet relatively independent institutions that produce hybrid organizations by means of taking the roles of each other. This variant, which is sought for in most of the countries, attempts to “realize an innovative environment consisting of university spin-off firms, tri-lateral initiatives for knowledge based economic development, and strategic alliances among firms (...), government laboratories, and academic research groups” (Etzkowitz & Leydesdorff 2000, 112). Here, the role of the university is to take care of scientific research and higher education and to contribute to firm-foundation and regional economic development. The government seeks to support commercialization of university research by means of public policy measures, while the industry takes “the role of the university in developing training and research” (Etzkowitz & al. 2007, 16), in addition to pursuing its traditional economic mission.

At present, Etzkowitz claims, countries all around the world are on the threshold of a new era, that is, the coming of the Triple Helix III. The most important feature of this change is the functional alteration of each of these institutions; universities, for instance, start to emphasize entrepreneurial tasks simultaneously as industrial enterprises take on the academic dimension of producing and sharing knowledge and training employees (Etzkowitz & al. 1998, Etzkowitz & al. 2007). At the

level of research practice, academic research turns into “an entrepreneurial science”, which comprises theoretical, methodological and commercial objectives and integrates academic investigation with corporate activity (Etzkowitz, 1998, 826-827). The economic logic, therefore, strengthens within universities and leads to the commercialization of academic knowledge (Etzkowitz & Leydesdorff 1998, 2000). It also leads to the internal transformation of academic research groups into “quasi-firms”, that is, firm-like entities managed by professors who devote most of their time and energy to acquiring research funds, managing collaborative relations and taking care of other organizational tasks (Etzkowitz 2003b, Etzkowitz 2011). Once these quasi-firms start to participate in the capitalization of knowledge and technologies, the university begins to transform itself into an entrepreneurial one.

As implied above, the entrepreneurial university involves the incorporation of the traditional academic mission, “the extension of knowledge”, into a compatible relationship with the “capitalization of knowledge”. The entrepreneurial university is thus a hybrid organization, which seeks to advance economic development alongside scientific research and higher education. Being supported by national and supra-national innovation policies this entails establishment of technology transfer offices, science parks and business incubators, as well as various kinds of administrative offices and committees that respond to problems and opportunities created by emergent entrepreneurial activities (Etzkowitz 2003b, Etzkowitz 2011).

The entrepreneurial science that sprouts from the triple-helix relations becomes institutionalized not only at the level of the university organization but at the normative structure of science, too. Here, Etzkowitz (2011) builds on the work of Robert K. Merton (1942/1959) who saw science as being characterized by a particular kind of cultural ethos that guides the appropriate scientific practice and supports the goal of science – the extension of certified knowledge. According to Merton, the ethos

of science is manifested by a set of institutionalized imperatives – universalism, communism, disinterestedness and organized scepticism² – that reward those who follow them and sanction those who violate.

The norms of science, as articulated by Merton, are not compatible with entrepreneurial science, which seeks to privatize knowledge and gain economic benefits from it. Etzkowitz (2011) claims, however, that a normative change in academic science is going on: the new set of norms supporting entrepreneurship is emerging. The alteration of the U.S. patent legislation during the 1980s, for instance, indicated the modification of the Mertonian norm of communism, i.e. collective ownership of scientific findings, to “‘limited secrecy’, with research results kept under wraps until their economic value could be protected” (ibid., 551). In Etzkowitz’s perspective, the same holds for disinterestedness, too: Scientists are no longer required to disengage their personal interests from their academic work but are allowed to pursue personal economic and social interests of their own (ibid., 552; also Dzisah 2010). The new norms of science do not, however, replace older norms once and for all but become conflated with them, for instance, by means of creating organizational policies to deal with possible conflicts of interests. Universities thus lay the foundations for the normative change by producing rationalizations to show that old norms are not being violated by new forms of organizational behaviour (ibid., 561).

In Etzkowitz’s (2002a, 121) perspective, the emergence of the entrepreneurial university is an irresistible, unavoidable development, not so much a matter of evolution, “but of an internal dynamic working itself out.” Furthermore, the emergence of the entrepreneurial university is a

² Merton (1942/1959) describes the norms as follows. Universalism requires that the evaluation of scientific claims is made using pre-established impersonal criteria: “the acceptance or rejection of claims [...] is not to depend on the personal or social attributes of their protagonist; his race, nationality, religion, class and personal qualities are as such irrelevant” (ibid., p. 553). Communism states that findings of science are to be kept a product of social collaboration and are thus owned by the scientific community. Disinterestedness refers to the pattern of scientists to disengage their personal interests from their work, implying a virtual absence of fraud in science. Finally, organized scepticism refers to the tendency of the scientific community to avoid making claims on issues that are not yet firmly supported by data.

phenomenon observable all over the world (Etzkowitz & al. 2000a, b). In his work, Etzkowitz has found examples of entrepreneurial universities from a number of countries, such as the U.S. (Etzkowitz 2002b), the Netherlands (Etzkowitz & al. 2007), Canada (Etzkowitz & al. 2007) and Sweden (Etzkowitz & Klofsten 2005). Further, he is convinced that the tendency of forming entrepreneurial universities will become even stronger in the future, that is, the technology transfer and incubation of new firms will convert from happenstance into permanent activity of the university, taking place in each and every department. “The University of the Future”, to use his terminology, will be a business incubator entirely. Even the potentially controversial activities of the contemporary university – research, education, societal service and economic development – do not hinder this development as the university incorporates these functions and reconciles their apparently contradictory objectives (Etzkowitz 2002a, 127). In effect, various kinds of problems visible in present-day universities are just symptoms of the changing role of the organization. These will disappear as the new type of university takes hold: “the ‘opposing’ norms and orientations are reinterpreted, emphasizing harmony rather than disharmony, mutual reinforcement rather than detraction from each goal” (Etzkowitz 2003b, 116).

Having been initiated in the mid-1990s, the constant flow of research associated with the triple-helix model and the entrepreneurial university has evidenced the vitality of the original idea. The research utilizing the model has gained momentum by means of forming an international Triple Helix Association and a set of regular triple-helix conferences. Because these arrangements gather together not only academics but policy-makers, administrators and business people, too, triple helix has evolved from being a descriptive framework and an analytic tool used in social scientific research into a normative model used to foster technological innovation and economic growth. An early example of developmental use of triple helix was a stage model of knowledge-based regional development, which began from developing the idea of a new regional model, proceeded to starting,

consolidating and adjusting new activities and finally ended with self-sustaining economic growth (Etzkowitz & Klofsten 2005). Later on, the developmental models based on triple helix were directed at improving the innovation systems of the third-world countries by means of putting the basic elements of an innovation system in place and by enhancing the circulation of people, ideas and innovations between the three helices (Dzisah & Etzkowitz 2008). Here, there seems to be some similarities to higher education research where “world cultural approach” has been connected to neo-institutional theorizing (e.g., Boli & Ramirez 1986; Schofer & Meyer 2005).

Furthermore, the analytical and developmental use of the model in such societies as Germany, Sweden, China, Brazil and Ethiopia has led to theoretical divergence of the model from the original idea. Etzkowitz, in collaboration with Zhou, has, for instance, proposed a distinct concept of *sustainability triple helix* to complement the *innovation-related triple helix* described above. The central difference between the two is to substitute public for industry in order to account for issues of public concern, such as controversies over new technologies (Etzkowitz & Zhou 2006). When it comes to typological moves of this kind, we are tempted to ask what will be gained by holding on to ideal typical understanding of the university (or multiversity, see Kerr 1963). Indeed, the triple-helix discussion would do quite well in producing more elaborated theoretical and empirical connections to historically solid description of change in university system that Jarausch and others (1983, 10) have called “seismic shift”, a transformation which entailed the emergence of a more inclusive and complex system of higher education between 1860-1930s. Another major theoretical development within the triple-helix literature is the difference made between neo-institutional or neo-corporatist interpretation of the triple helix, represented by Etzkowitz, and the systems-theoretical evolutionary model developed by Leydesdorff (1996, 2000, 2005) as well as Viale and co-workers (Viale & Campodall’Orto 2002, Viale & Pozzali 2010).

3. Theoretical Status and Further Development of Triple-Helix Model

Before entering into a discussion about the further developmental paths to be taken in the development of the triple-helix model, it is useful to address its status as a sociological theory. To do so, we shall apply the general classification of sociological theories as presented by Noro (2000). According to Noro, there are three types of sociological theorizing, i.e., research theories, general sociological theories and diagnoses of the era.

The first type of sociological theory is research theory. It refers to theorizing which is directly linked to empirical evidence. A research theory, then, is a theory developed on the grounds of such evidence: it is a theory used and further elaborated in empirical social research to make sense of some observable social phenomena. Research theory thus covers all kinds of conceptual constructs developed and used in empirical social research. An example of work done at the level of research theory within the triple-helix literature is the discussion about the emergence of the entrepreneurial university summarized below.

The second type of theory is general sociological theory, which applies to theories that address general sociological topics like the constitution of society or culture. These kinds of theories do not straightforwardly relate to empirical material. Nevertheless, general theories make use of the results achieved by empirical research as well as the scientific discussions taking place at the level of research theories. Examples of general sociological theories mentioned by Noro include Parsons's theory of social action and Luhmann's systems theory. Often this type of theory is general enough to enable its reading as a general theory of a variety of differentiated social sciences. Luhmann's systems theory, for instance, could be seen as communicating between general systems theory and general sociological theory thereby facilitating conceptuality far beyond empirical sociology. In the

context of the triple-helix literature, ideas that originate from general sociological theories include, for instance, the conceptualization of triple helix according to the systems theory as a set of components, relationships and functions (Ranga & Etzkowitz 2012).

Finally, the third type of theorizing is the diagnosis of the era. Referring to the German historian of ideas Reese-Schäfer, Noro conceives of diagnoses of the era as theories that seek to answer existential questions asking who we are and what is the nature of our epoch. Such descriptions of the spirit of the age usually combine familiar material in a novel way, are normative in nature and endeavor to yield new topical insight. Therefore, their relationship to the empirical evidence is complicated: they cannot be used as a means to directly interpret empirical material since we would only find in the data what these theories already imply. In academic writing, examples of diagnoses of the era include Giddens's (1990) "The Consequences of Modernity" and Beck's (1992) "Risk Society". In English language, such theorizing is often called social theory, a term which easily produces ambiguity in relation to the general sociological theory. Within triple helix discussions, ideas that relate to diagnoses of the era include attempts to make the model useful in terms of practical policy making (e.g., Dzisah & Etzkowitz 2008).

In our perspective, then, discussion about triple helix appears to draw from all these types of theory thus allowing liberties of using concepts such as system, organization, institution or institutional sphere in the most general way. To some extent, this feature also maintains theoretical inconsistency of the triple-helix model and causes discrepancy in its empirical directionality. However, when scrutinizing the literature about triple helix work done at the level of research theories is dominating. In this respect, two major foci can be identified. First, scholars all over the world have investigated whether or not institutional spheres of university, industry and government have become integrated more closely than before and, second, some researchers have scrutinized the

transformation of these institutions, with the emphasis of that being placed on the emergence of the entrepreneurial university. These lines of inquiry constitute important topics for empirical research and synthesis of observations at the level of research theories. The model's inconsistency at the level of general theory tends to form epistemic blocks for empirical cumulative development, however: the lack of consistent conceptualization or elaboration makes it difficult to compare research over time or between different national and regional contexts thereby inhibiting accumulation of empirical observations into solid theoretical interpretations and propositions.

At the level of research theory, empirical observations originating from different countries seem to confirm the central claim of the triple-helix model, according to which there is increasing interaction between different institutional spheres of society. An early example of studies focused on this topic was that of Kaukonen and Nieminen (1999). Analysing the Finnish developments over several decades, the authors claim that there has been a long-term transition in the country towards more intensive university-industry-government relations. These connections began to evolve in the late 1970s, as research expenditures increased in private industry and in governmental research institutes while the relative share of funding of universities declined. In consequence, the Finnish research system was gradually restructured and the priorities of the national science and technology policy were altered towards competitiveness-oriented innovation policy (Kaukonen 1987; Nieminen & Kaukonen 2001). Although the statistical data used by the authors did not allow for the analysis of actual interactions between universities, government and industries, they argue that it is justified to speak about the development of "a Finnish Triple Helix" (Nieminen & Kaukonen 1999, p. 338; also Kivinen & Varelius 2003). Similar results emphasizing a general transition towards closer interaction between the three institutional spheres have been found in many other countries, including the U.S. (Giesecke 2000), Germany (Leydesdorff & Fritsch 2006), Sweden (Benner & Sand-

ström 2000), Singapore (Leong & al. 2008; Wong 2007), Malaysia (Razak & Saad 2007), China (Zhou & Peng 2008), Mexico (Rivera Vargas 2010) and Brazil (Etzkowitz & al. 2005).

The second line of empirical research associated with triple helix has addressed the vitality of the idea about the transformation of institutional spheres, especially the emergence of the entrepreneurial university. According to the model, the increasing interaction between university, industry and government not only brings about closer interaction between heterogeneous actors and the birth of the so-called intermediary organizations (Suvinen & al. 2010, Metcalfe 2010), but also induces transformation of each of the institutions, either through innovative individuals (Göktepe-Hultén 2008) or changing governmental policies (Zhou & Peng 2008). As maintained by Etzkowitz (2003a), this holds true for all major organizations, including the traditional university.

At the level of research theory, Catholic University of Leuven (K.U. Leuven) is an early example of a European university, which has transformed itself into an entrepreneurial mould (Etzkowitz & al. 2007). Already since the 1970s, the university established a technology transfer unit, K.U. Leuven Research and Development (LRD), which played an essential role in the development of entrepreneurial capabilities of the university's personnel. Unlike other Flemish universities, where technology transfer was managed through regular university administration, LRD enjoyed considerable autonomy at K.U. Leuven while still being integrated into the university structure. LRD was free to manage the revenues earned from entrepreneurial activities, which helped it to create a broad spectrum of advisory, co-ordinating, administrative and clearing services that made it a model for other universities in terms of supporting academic entrepreneurship. The results of LRD in promoting commercial activities were substantial: at the turn of the millennium, the university owned 171 patents, in addition to which it co-ordinated 58 spin-offs and provided 24 per cent of K.U. Leuven's R&D budget. Other case examples of entrepreneurial universities include the

prestigious U.S. universities, such as MIT (Etzkowitz 2002b) and Stanford (Etzkowitz 2003b) as well as the University of Saskatchewan in Canada (Etzkowitz & al. 2007), Lund University in Sweden (Göktepe-Hultén 2008) and the University of Singapore (Leong & al. 2008; Wong 2006). Initial steps towards entrepreneurial activities in universities have also been found in China (Zhou & Peng 2008).

This empirical evidence is convincing in demonstrating that commercial exploitation of research has become an important mission of contemporary university. Etzkowitz and his co-workers (Etzkowitz 2002a; 2003b; Etzkowitz & al. 2000a; Etzkowitz & al. 2008) pursue, however, a stronger interpretation of than this. They not only assert that some universities are increasingly engaged in supporting entrepreneurship through auxiliary structures and functions, such as technology transfer units, but claim that the university's evolution into an entrepreneurial one is an all-encompassing, inevitable and global phenomenon covering all types of organizations in each and every country. Furthermore, economic functions, such as incubation of new firms, will be spread throughout the university structure: Incubation will be decentralized, that is, it will become a regular feature in each department or academic unit (Etzkowitz 2002a, 127). This thesis is often substantiated by chronicling the histories of MIT and Stanford and holding that other institutions are emulating these models. While this is evidently true for some universities, there are opposite findings, too, that assert that only a minority of academics and universities are highly-oriented towards financial activities (Albert 2003; Deem & Johnson 2003; Harrison & Leitch 2010; Philpott & al. 2011).

Further evidence on the problematic nature of the entrepreneurial university thesis is provided by studies that shift the analytical focus away from the university organization to the actual practices that take place at the grass-roots level of university departments. Tuunainen (2005), for instance, studied a case of a hybrid firm at the University of Helsinki, Finland. A hybrid firm is a company

that straddles the public and private spheres of activity. It is a commercial enterprise which is still located “within the university and dependent on the university for a degree of administrative and financial support” (Etzkowitz & al. 2000b, 320). Because the staff of such a firm occupies academic and company positions concurrently, the hybrid firm may be regarded as a useful touchstone for the viability of the entrepreneurial university model in practice. In the case analyzed by Tuunainen, serious conflicts emerged between the members of the hybrid firm and the university administrators. As a result of this, the hybrid entity was abandoned and the firm sealed away from the university department in a peripheral organizational position, with the business incubator operating in a science park.

Tuunainen takes this case as counter-evidence for Etzkowitz’s assertion that commercial impulses penetrate the entire university organization in a straightforward and thorough manner. In contrast to this, he suggests that a distinction should be made between special intermediary structures that assist technology transfer within the university and the core academic units, such as departments. While the auxiliary parts of the university may, indeed, reach out to the corporate world, the academic core may still dissociate itself from entrepreneurship. These results were later augmented by another study with essentially similar kinds of results (Tuunainen & Knuuttila 2009). Results achieved by Jolkkonen and Kantasalmi (1993) on the emerging third mission activities in the context of continuing education centers of Finnish universities pointed to the same direction. The authors concluded that tensions emerged between academic departments and faculties that controlled academic degrees and continuing education centers and extension units that were managed according to firm-like organizational principles. In fact, there exists a wide literature about university adult education, which provides evidence on this tense relationship, which not only creates problems but also produces innovative outcomes in the continuously changing borderline between academic core and auxiliary units of the university (Kantasalmi 2001; 2010).

Commenting on the study by Tuunainen and Knuuttila, Etzkowitz and Zhou (2008) draw attention to a normative shift that is probably going on in the case university: The initial negative reaction of the university administration to the existence of the hybrid firm may not remain valid in the long run. In their perspective, the normative change within evolving entrepreneurial universities incorporates gradual resolution of conflicts by means of re-interpretation of the commercial activities as broadly compatible with existing university activities. This is to say, controversies over entrepreneurship are indications of ongoing transformations and they will be reconciled in terms of new normative structures that make business activities compatible with the advancement of knowledge (Etzkowitz 2011). Tuunainen and Knuuttila (2008), in their study on the normative change at the grass-roots level of the university departments did not find, however, any sign of this but concluded that the scientific community and the university institution are still largely operating according to some rather stable, traditional norms of science, such as the primacy of teaching and research over commercialization. In comparison to academics, the role of technology transfer officials in the maintenance of boundaries between organizations is different; these professionals make efforts to accommodate academic and commercial norms for one another while simultaneously protecting academia from direct entrepreneurial influence by setting the terms of exchange between the two institutional spheres (Sanders & Miller 2010).

So, what should be concluded on the basis of a debate like this? First, the point made by Etzkowitz and Zhou (2008, 633) is evident: To pursue entrepreneurial science is a risky venture in a university bound by traditional principles of separation between research and commercial activities. Finding a balance between commercial activities and research and teaching is, thus, a continuous debate, the results of which are far from certain. The second lesson to be learnt from the case example is the fact that a more differentiated understanding of the university's internal structure should be made

within the triple-helix literature. Otherwise put, universities are complex entities that may simultaneously incorporate contradictory activities in different parts of their organization. It is thus questionable to make broad generalizations about the university's overall development without simultaneously acknowledging that goals and missions may differ from one internal unit to another. The third point to conclude is the fact that universities and disciplines are dissimilar: While universities may lean towards commercialization, this general pattern may be differentiated, not only by university type (Häyrinen-Alestalo & al. 2000) but also according to disciplines and specialties; some universities and departments may be nearer to industry than others (Martinelli & al. 2008; Mathieu & al. 2008; Nieminen & Kaukonen 1999; Ylijoki 2003). As concluded by Mathieu and others (2008, 678), universities do not need to turn "all entrepreneurial" in an organizational sense to contribute to national or regional prosperity.

When it comes to further theoretical elaboration of the transformation of the university, we believe that the notion of organizational field as used in neo-institutional theory of organizations (DiMaggio & Powell 1991) might offer useful theoretical insight within the triple-helix model to further understand the grey zone that exists at the edge of the university as a bounded organization. Another line of thought potentially useful in further elaboration of the thesis would be Luhmannian systems theory. To overcome the problem of entering into sweeping generalizations or overly bold interpretations about the emergence of the new type of university, empirical case studies that chronicle structural and normative changes in universities might be sharpened by making distinction between university as an organization and university as an institution (Luhmann 1992). In addition, some recent developments in Luhmannian systems theory, namely, the analysis of the global endeavour of science (Stichweh 1996) and Luhmannian network analysis (Besio 2011; Schneider & Kusche 2011), might offer interesting perspectives for the triple-helix community to apply in research.

Both of these conceptually rather well-founded traditions emphasise a need for a more solid theoretical understanding of the university in the context of triple helix as “complex super system” with “meta-stabilization functions” and “reflexive characteristics” (Leydesdorff 2000). Not only Leydesdorff’s but Etzkowitz’s (Ranga & Etzkowitz 2012) recent work, too, acknowledges the need of further theoretical specification of the triple-helix model. Interestingly enough, in different publications the potential sources of theoretical refinement differ, the most relevant of these being neo-institutionalist theory of organizations and systems theory. While we strongly support the work towards these lines of development we also want to point out that these conceptualities are not self-evidently connectable for complementary purposes. The common denominator between the two theories is, however, the acknowledgement of two distinguished perspectives on university, i.e., the university as an organisation and an institution; university need to be viewed in both of these ways.

The ongoing research around triple helix has directed attention to interesting developments taking place at the interface between university, industry and government. The two major protagonists of the model – Etzkowitz and Leydesdorff – also appear to promote two major avenues for producing a more consistent and theoretically sound research approaches concerning the triple-helix model, i.e., neo-institutional organization theory and systems theory. It is far from self-evident, however, that neo-institutionalism and the Luhmannian conceptuality would easily communicate with one another as complementary theoretical options for the model’s further development. We thus believe that it is important for the triple-helix research community to work towards advancing a multi-layered empirical research agenda aided by more developed theorizing about the university organization – adhering to a loose, ideal typical notion of the entrepreneurial university may not be the most fruitful way to proceed.

In our perspective, then, the current university is a polycontextual organization. It appears to be in the process of being redefined by intensified commercialization expectations that challenge and complement its traditional functions, public research and higher education. Nonetheless, the organization still has a rather clear bifocal core in teaching and research. These two differentiated missions with self-referentially constituted communicative autopoiesis have been structurally coupled for centuries. In the contemporary university, we can still see these bifocal functions being represented and connected to differentiated societal systems of education and scientific research. So, in our view, there has never been an “ivory tower” in the meaning of societally isolated university, although it used to be “walled” and exclusive in its practices. Even the medieval university had its markets, but naturally quite differently organized than markets of the present-day functionally differentiated society. As rightly observed by Etzkowitz and others, the third mission of the university, i.e., societal service and economic development are gaining stronger foothold within the organization with close connections to different kinds of research and teaching activities. So, for us it is rather the nature of the couplings that are changing, not the entire missions themselves. Instead of contenting ourselves with ideal typical notions of the university, such as those of multiversity or entrepreneurial university, we should therefore ask how the differentiated societal systems have been internalized in different historical and current contexts of the modern university. This, in our view, is a major mission for the triple-helix community to address.

As illustrated by the above-mentioned results and debates, much of the discussion related to triple helix takes place at the level of research theories: it is at this level that central claims made by protagonists of the model are put into the test by means of empirical research. The level of research theory is not, however, the only plane wherein the triple-helix model operates. In addition to being an empirical description and analytic device, triple helix involves a strong political aspect as well as it intends to be a heuristic and developmental tool used by policy-makers to advance innovation in

different countries. In line with this, Dzisah and Etzkowitz (2008) suggest that triple helix should be regarded as a developmental method of creating more effective innovation systems especially in developing countries. As a matter of fact, several scholars have made attempts to develop the innovation systems of their particular countries by using the triple helix as a methodological tool and normative ideal. Examples of this involve the application of the triple helix as a motor for developing telematics in Portugal (de Castro 2000) or university-industry relations in Latin America (Sutz 2000). Etzkowitz (2003a, 334), too, refers to triple helix as providing a useful framework for knowledge-based economic and social development. On the basis of comparisons made between the U.S., Japan, Sweden and Brazil, he and his co-workers (Etzkowitz & al. 2008) suggest that it is high time to make massive investments in the technology transfer and translational research capacity especially in Europe so as to foster the development of entrepreneurial universities. Whereas triple helix in this mould clearly represents just another version of the diagnosis-of-the-era type of theorizing, the growing body of empirical research counterbalances and neutralizes at least some of its normative tendency and over-theorization (Elzinga 2002, 15, 25).

4. Conclusion

Summarizing the empirical and theoretical discussion concerning the triple-helix approach the present article claims that triple helix involves aspects of three kinds of sociological theory, that is, research theory, general sociological theory and diagnosis of an era. A research theory refers to theorizing, which is directly linked to empirical evidence about some important societal phenomenon. As far as triple helix is concerned, a large number of researchers have emphasized the general transition towards closer interaction between the three institutional spheres of society. Another major line of research and, indeed, a debate within the triple-helix literature concerns the transformation of the university: Is it becoming entrepreneurial all the way down? Characteristic of these

studies is to establish a strong linkage between the general claims of the triple-helix model and empirical data, thereby making the theory amenable to empirical scrutiny in different national and regional contexts. Etzkowitz (2011), for instance, has maintained that changes in the fundamental principles of the global system of science have occurred. One of these changes is the emergence of limited secrecy. When analyzing empirical instances like this, we may give birth to quite different theoretical interpretations depending on whether we want to highlight the normative change as Etzkowitz does or stress the organizational change in terms of analyzing thick communication in the cases of reference problems identified self-referentially by social systems during their ongoing autopoiesis. Before we can decide which one of these interpretations is more justified than another, we should, in our view, pursue a more detailed analysis of scientific and organizational practices and interactions with similar kinds of self-referentially-viewed problems. Here, one could empirically examine the proposed thesis about “limited secrecy” in different instances of scientific and organizational decision-making, that is, in doctoral dissertation examinations at universities, research funding decisions in research councils and publication decisions in scientific journals, to name a few. In addition to this, we need to ask, of course, what are the risks expected to follow from the erosion of the publicity in science.

As claimed above, triple helix also represents a general sociological theory, which is a theory that on a conceptual level characterizes and explains the nature of society, its organization and its historical development. These kinds of theories do not straightforwardly relate to empirical material, although they may apply results achieved by empirical research as well as scientific discussions taking place at the level of research theories. In this respect, we would like to see more rigorous elaborations of triple helix in the context of two major lines of general sociological theory, namely, neo-institutional school of organizational research and Luhmannian systems theory. In the case of polycontextual university, successful complementarity between these two lines of thought would,

however, require theoretical comparison at the level of general sociological theory. In this respect, Hasse and Krücken (2005) have already taken interesting steps in advancing our theoretical understanding of the two theories, steps that might provide useful ideas also for those who want to address the triple-helix relations.

Finally, triple helix involves aspects of diagnoses of an era. As theories, diagnoses seek to answer existential questions of who we are and what is the nature of our epoch. They are messages sent out from scholarly discussion to a wider learned public. When it comes to triple helix, aspects of diagnosis-of-an-era type of thinking were visible in the model's metaphorical and ideal typical nature and its suggested use as a political tool to create more effective innovation systems. In this sense, it could be subjected to sociological analysis focusing on how such cultural construct effectively contributes to the birth of policy homologues and eventual isomorphism in organisational arrangements. Such line of inquiry could also benefit from neo-institutional theory of organizations. However, since this perspective rests on some problematic assumptions with regard to societal dissemination mechanisms, we do believe that systems theoretical conceptuality might offer more advantages. These advantages, in our view, could be achieved by means of combining differentiation theoretical views on communication with theoretically-founded understanding of self-referential enclosures within the autopoiesis of social systems. The functional "eigenlogik" and tendency to strictly demarcate specific codes that maintain the boundaries of societal systems enables increasing coherence in elaborating the boundary crossings in organizations, such as university-centred complex systems of higher education. Organizations, such as universities, allow structural and instantaneous operative couplings to take place in overlapping zones of societally differentiated and operationally closed social systems. We believe, therefore, that analysis of empirical case examples, such as hybrid organizations within universities, would benefit from accuracy of description achieved by means of applying systems theoretical conceptuality. Furthermore, the hypothesized

organizational and institutional change towards global triumph of the entrepreneurial university (under redetermination effects of “meta stabilizing” and “reflexive overlay” of triple helix) might benefit from a better theoretical specification of empirical propositions.

In our perspective, then, there is an urgent need to bring empirical studies on triple helix on more fertile cumulative track. We believe that such productive spin-off only can be achieved by emphasizing conceptual work at the level of general sociological theory. In this respect, we have pointed out the importance of making distinction between the concepts of organization and institution, both of which open up substantive areas at the level of research theory to describe the contemporary university. In addition to this and with regard to epistemic utility of the triple-helix metaphor, there is an evident need to develop a more consistent research program on its promising heuristics. In order to achieve more coherent research programme, the systems theoretical conceptualization of the idea about the emergent “super system“ with “reflexive characteristics” and “meta stabilizing” effects (Leydesdorff 2000) would be necessary. Here, global processes associated with triple helix certainly redefine societal subsystems and their structural couplings within the polycontextual university. Thus, we would need work at the level of general sociological theory to allow sufficiently abstract constructs to be developed for dealing with the complexity that occurs when the couplings between education system and science system are rearranged in the organization complex of higher education. In world societal redefinitions of the university, two forms ensuing from societal evolution have gained dominant position, those of the firm and school, both of which are increasingly being followed. The contemporary development therefore points far beyond the explanatory capacity of Parsonian views on successful normative ordering of the university-centred “professional complex”. In the theoretical tradition of sociological systems theory, we see promising perspectives that help us in distancing ourselves from normative functionalism and

advancing in what Kangas (2012) calls the contingency theoretical functionalism in Luhmannian thinking.

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