

TRANSDISCIPLINARITY AND DISCIPLINARITY IN THE UNIVERSITY OF THE FUTURE

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Summary

By taking on a ‘third mission’ of economic and social development, in addition to research and advanced education, universities have become key institutions within the ‘knowledge society’. Demand from society is rapidly changing academic organizational values, communication patterns, activities and expectations. New and unfamiliar structures, like cross-sectoral, transdisciplinary research centers, are emerging. Pressure for academic *specialization* is leading to the creation of new disciplines or sub-disciplines. Demand for social *relevance* is driving cross-sector collaboration and transdisciplinarity. Social demand is shaping not just the kinds of research and education carried out in universities, but also the forms of funding, and the structures and units within which the work is carried out.

Evidence of increased transdisciplinarity can be found in academic structures, communication patterns and the socio-economic connections of research. The academic

‘discipline’ encompasses several spheres of influence: departmental structure, career path, degree designations, and legitimate topics of research. The pressure for change within each of these spheres may be quite different. Further, the trend towards greater social engagement is not uniform across academic disciplines. Evidence shows that some disciplines are more outwardly oriented and collaborative – in the cognitive and organizational sense – than are others. ‘Organizational turbulence’ at the level of the institution, discipline and academic unit is the result.

Whether current trends represent the evolution, the erosion or the destruction of the disciplinary model of ‘academic science’ is an open question. There is strong pressure to assimilate transdisciplinarity within the university on at least equal terms with the established disciplines. The 21st Century university will probably emerge with a new, and possibly localized, organizational mix of disciplinary departments, interdisciplinary centers and new disciplines. This poses challenges for the future management, organization, culture and rewards systems of the university, which were formerly discipline-based.

1. Introduction: Universities and the Socialization of Knowledge Production

Research and observation over the last decade suggests that, all around the world, universities are taking on a ‘third mission’ – that of economic and social development (the ‘social role’)– in addition to their established roles of research and advanced education (the ‘scientific role’). In this, universities are responding to the emergence of the ‘knowledge society’, (the growing importance of knowledge to economic and social development) and in particular to technological innovation based upon scientific research. In the process, the university has become a key, or even, some argue, *the* prime institution in the knowledge society.

The knowledge society is in itself product of the ‘massification’ of higher education over the last 50 years. Mass access to higher education has led to demands for degrees that are more relevant and a greater ‘socialization’ of knowledge production. Knowledge and skills are now more widely distributed in the community: industrial innovation is no longer the preserve of industry, and fundamental research is no longer the monopoly of the university. This has produced greater *competition* between universities and other ‘knowledge institutions’ but also a greater potential for *collaboration* between them. Spurred on by the technological sophistication of industries, effective research and application require increased cooperation between all sectors of society, notably between enterprises, universities and government. The players in the ‘learning economy’ increasingly turn to the university for collaboration in research, training, and service expertise.

At the same time, universities are pressured to ‘corporatize’, to seek commercial outcomes and to steer research according to institutionalized performance indicators. The commercial market has entered the domain of university disciplines, rapidly changing organizational values, actions and expectations. As the socialization of knowledge and the corporatization of academia intersect, a blurring at the organizational boundaries is spurring the development of transdisciplinary groupings within traditionally discipline based teaching institutions. Research is increasingly being

carried out in organizational forms built around cross-sectoral and transdisciplinary teams with well-defined national social, economic or environmental objectives in mind. As a result, new and unfamiliar forms of organizational culture are emerging in universities.

Two influential models have been developed to explain the institutional configuration of knowledge-based innovation systems that can be observed in many countries today. The ‘triple helix’ model of university-industry-government relations advanced by Etzkowitz and Leydesdorff premises that the university ‘can play an enhanced role in innovation in increasingly knowledge-based societies’. Gibbons and his co-authors propose a ‘Mode 2’ of knowledge production which they term ‘science in the context of application’. This contrasts with, and appears to be supplanting, traditional ‘Mode 1’, that is, internally focused scholarship controlled by strong disciplinary peer groups.

In the view of some analysts, these changes to the way that knowledge is produced undermine the Mertonian norms of disinterested academic scholarship, and thus the intellectual independence of the university. Academic structures with these ‘monastic values’ are equated with the traditional disciplines and ‘Mode 1’ research. Conversely, ‘Mode 2’ entrepreneurial research and ‘triple helix’ organizational arrangements are seen as inherently cross-disciplinary. Thus the debate about the future of university scholarship has sometimes been cast as the tension between transdisciplinarity and disciplinarity. But this is an oversimplification. Disciplines are not as rigid or immutable as some suggest, and professionalization and like-minded communities of interest, networks and invisible colleges can and do exist outside the established discipline boundaries. Further, the ‘social’ and the ‘scientific’ role of the university may be mutually sustain, rather than compete for, academic rewards and resources. Etzkowitz thus characterizes the contemporary university as comprising a ‘creative tension’ between fundamental and applied research, entrepreneurial and scholastic interests and between discipline-based structures and transdisciplinary centers.

In reviewing the role of disciplines and transdisciplinarity in the university, the current article considers four questions.

- First, does the diversification of the loci of knowledge production mean that universities are becoming less important? Is their influence (and the influence of academic disciplines) on knowledge generation and transfer being ‘diluted’?
- Second, if ‘science in the context of application’ is indeed the main driver of transdisciplinarity, is this socialization of knowledge having selective impact on different academic disciplines?
- Third, are the trends in the diversification of knowledge production global and universal, or do they exhibit *national* differences in their impact on the university system?
- Fourth, what is the actual and likely future effect of increasing transdisciplinarity and socialization of knowledge on university structures and management? Do these trends lead towards a global model for the ‘21st Century University’?

The article briefly describes recent changes in the observable structure of universities, in their external relations and linkages, in their steering by social demand and public

policy, and in their academic organization and communication patterns. First, however, it is useful to consider what is understood by academic disciplines, and why the ‘socialization of knowledge’ is seen as eroding their power.

2. Disciplines and Transdisciplinarity

The *discipline* as the primary unit of internal differentiation of academic science has a recent history (see *Differentiation of Scientific Disciplines*). Disciplines serve plural roles in the organization of teaching, in formal communication and scientific publication, in career structures for academics, and not least in providing a structural or organizational framework for universities, i.e. physical academic units like departments and schools (see *Differentiation of Scientific Disciplines*). In other words, disciplines are both *intellectual* and *social* structures. Disciplines in the social sciences and humanities are usually considered less robust, and more ‘permeable’, than those in the natural sciences and engineering. The drivers of *transdisciplinarity* can come from ‘within science’ or from ‘outside science’, from the demands of society or from other players in the knowledge society. ‘Internally’, interdisciplinarity is provoked by ‘intellectual’ or ‘big motivational’ questions. It occurs through the use by disciplines of each other’s methods and analytical techniques, such as the use of research equipment developed in another discipline (e.g. chromatography); it can arise when disciplines co-focus on a major research facility or platform, such as a particle accelerator or radio-telescope. ‘Externally’ there may be demand to integrate different disciplinary knowledge, concepts and theories and data to investigate complex systems (e.g., modeling climate change); there is certainly requirement for a problem-based approach to pressing environmental and social issues (e.g., environmental pollution, public health) with respect to sustainable development. Lastly, there is the identified trend toward academic involvement in technology development ‘in the context of application’, also related to the sustainability model.

While academic disciplines are dynamic, the pressures on them for change now seem unprecedented. There is strong evidence that the socialization of academic knowledge is weakening at least the *organizational* aspects of disciplines. This is evident in the formation of multidisciplinary university research centers, in the salience of horizontal links between universities, industry and other socio-economic sectors in research and training, and in the blurring of the boundaries between basic and applied research in most fields of research. Academic disciplines in the process of adapting to such change are driven in two opposing directions. They are driven towards fragmentation and *specialization* in order to capture or retain a professional niche, yet at the same time they are driven towards identifying their *relevance* for the widest possible segments of society. It is the quest for relevance that appears to be driving the organizational trend towards transdisciplinary academic structures and patterns of communication. Demand from society (rather than from within science) is changing the organization and structure of academic research and scholarship.

3. Theoretical Models of the Role of Universities and Disciplines

Two influential (though contested) models have emerged recently to explain the institutional configuration of knowledge-based innovation systems that can be observed

in many countries. These are the ‘triple helix’ model of university-industry-government relations of Etzkowitz and Leydesdorff, and Gibbons, Nowotny and their co-workers’ model of ‘Mode 2’ knowledge production. Each implies a challenge to the traditional academic structure. It is therefore worth examining how each of these ‘post academic’ explanatory models views the evolution of the university, and of its academic disciplines, structures and communication patterns.

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Biographical Sketch

Sam Garrett-Jones is Associate Professor with the Centre for Research Policy, University of Wollongong, Australia. His research and experience is in public sector management and particularly in science, technology and innovation policy development and administration. He joined the university with ten years experience as a science and research policy adviser with the Australian Federal government. Garrett-Jones' research focuses on the changing role of the 'knowledge production' universities and research institutions in the 'S&T system' and on the effectiveness of related government policies. Garrett-Jones has sustained CRP's research as a leader of a series of research projects, notably on the dynamics of the higher education research system and university-industry collaborative linkages in Australia, on evaluating the outcomes of research, and on quantifying innovation and knowledge flows. He has contributed publications on the 'triple helix' perspective on university-industry-government relations and on the effect of 'Mode 2' research on scientific disciplines and institutions. In 'Using Basic Research' (1996) he also produced one of the leading empirical studies on the socio-economic connections of academic research in Australia's universities. He has recently co-edited a book on 'Innovation, Technology Policy and Regional Development: Evidence from China and Australia' (Edward Elgar, 2002). Sam has consulted extensively on science and technology policy and management issues for major clients in Australia, Thailand Malaysia and Indonesia and other countries and for international organizations including UNESCO, the World Bank, Asian Development Bank OECD and ASEAN. Sam holds a PhD from the Australian National University, an MSc in the Structure and Organization of Science and Technology (Manchester) and a BSc Hons. (Southampton) and has worked as a research scientist in the Pacific, Europe and America.