

Transfer of technologies: a cross-disciplinary taxonomy

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Abstract

Transfer of technologies (TT) takes place among various kinds of players, takes on various kinds of modalities and is done for various motivations. Its literature is very disjoint and disparate. It transcends several academic disciplines and professions. This paper presents a taxonomy defining the field in its entirety and delineating all of its facets in a manner that is parsimonious yet discriminating. Many potential uses for the taxonomy are identified. These include more effective teaching of TT subject matter.

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1. Introduction

1.1. Background

Technology transfer (TT) is an emerging field of knowledge in which institutional interest is rapidly expanding. Using the two key words in any web-based search engine will quickly attest the fact that it is key to the development and competitiveness. Firms use it to improve their competitive advantage [1]. It is used to enhance the competitiveness of an entire industry, a region within a nation's boundaries and an entire nation-state [2]. As in the case of the Caucasus and Central Asia it can enhance development of a multi-nation geographic region. It is a means toward economic progress, social development, quality of life, and even of culture and of value systems [3].

As is often the case in an emerging area or discipline, its descriptive as well as normative theories and data available are fragmented and disjointed. There is no general theory, model or structure for the field; people merely string information and insight on an invisible thread and hope that

the thread continues to hold. This is especially so because TT is of concern, to several major professions, in addition to several basic social-science disciplines. Moreover, it is of concern to policymakers in the public, private, and the not-for-profit sectors, and to decision-makers at the company or institution, community, regional, and national levels. It is also of interest to the multinational economic communities, some of which are established (e.g., *EU*), some of which are emerging (e.g., the Istanbul based, *Black Sea Economic Cooperation Business Council*), and some that have been relegated to history (e.g., the *COMECON*) [4].

Although there is at least one professional society dedicated to TT and the *Journal of Technology Transfer*¹ is now through its 28th volume year, economists, sociologists, anthropologists, engineers, and management theorists have established an interest in TT over a much longer period and yes they have contributed to TT knowledge albeit within their own disciplinary confines. Not surprisingly, the very *definition* of TT differs across the many disciplines

¹“The only international forum focusing purely on the transfer of technology” can be found at <http://www.kluweronline.com/issn/0892-9912/current>.

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addressing this subject. The scope of TT has rarely been delineated or systematically analyzed. Though several (limited) taxonomies of TT have been published, currently, TT can be understood only in a limited way from a strict disciplinary framework and/or a specific aspect.

1.2. Previous TT taxonomies

Because of TT's multifaceted and multidisciplinary nature, a cross-disciplinary meta approach is needed to study it as a subject area. Reddy and Zhao [3] did an extensive review of TT literature as viewed from different perspectives by some disciplines. Reisman [2] offers a generic TT taxonomy base categorizing the various TT "players" e.g., the providers, or transferors and the receivers, transferees, or users. Zhao and Reisman [5] offers a synthesis of TT taxonomies transcending all the disciplinary approaches. That synthesis incorporated interdisciplinary dimensions much broader in scope and having a wider variety of potential uses/objectives than any TT taxonomy existing as of 1992. Kumar et al. [6,7] created a taxonomy of TT motivations while this paper presents a TT meta-taxonomy incorporating or subsuming all of the above.

1.3. Motivations and uses for this taxonomy

As will be shown in Section 3 there are no fewer than 182 fairly independent TT attributes. Thus the number of distinct and meaningful combinations of these attributes is staggering.² That number represents distinctly different potential TT modalities.³ This fact alone is pregnant with meaning. Because of the enormity of this subject it is no wonder then the very mention of TT conjures different meanings to different people and different meanings at different times to a single individual.

This taxonomy offers a framework for classifying papers published in the various academic disciplines' literatures concerned with TT. Because it furthers our understanding of TT at both the conceptual and the operational levels it is intended for the researcher who chooses to study TT in an interdisciplinary manner. While the educator can use this taxonomy to present the TT subject matter in a comprehensive, comprehensible manner, the novice can grasp the wide spectrum of transactions possible in technology transfer. The seasoned worker can use it to pinpoint a market niche and the structural, operational and other characteristics of his or her involvement in TT in the context of the overall realm of possibilities. Corporate or institutional managers and/or directors can use it in developing TT strategies for growth/expansion, mergers, acquisitions, and/or divestitures. Policy makers can use it to formulate meaningful technology and/or TT policies.

² It is in the order of 6.1×10^{54} .

³ "Modalities" are to be interpreted as configurations of transactions or of contracts.

The taxonomy facilitates seeing the forest while at the same time knowing the exact size, shape, color, and texture of any tree. It allows us to identify the wide spectra of TT practices and of TT related theory and findings and allows for a systematic classification of any and all papers published irrespective of the author(s)' disciplinary base. Moreover, the taxonomy can facilitate marketing of TT curricula or courses through its efficient description of the field's diversity, richness, importance, relevance, and the richness of aspects that need to be understood and managed.

It can be used as an organizing framework in collecting and/or collating TT related data at the company/institution, region, economic sector, and/or national levels for purposes of:

- Doing *meta* research (MR) on TT:
- Adoption of an integrative approach—an interdisciplinary approach,
- Development of new concepts.
- Describing the extent of the practice:
 - By design.
 - By diffusion.
- Pinpointing voids/weaknesses in transfer mechanisms:
 - In institutions.
 - In policies.
- Pinpointing "ports of opportunity":
 - To companies, institutions, communities, states, geographic regions and to countries.
 - To professions.
 - To scientific disciplines.
 - To individual researchers [5].

It can also serve as a vehicle for collecting data to describe the profile or mix of transfer practices in and/or by an enterprise, a community, state, or region for purposes of:

- Stating job creation and/or employment levels.
- Stating wealth generation.
- Stating dollar expenditures.
- Justifying financing.
- Setting priorities for:
 - Public fund allocations.
 - Philanthropic giving.
 - Philanthropic fundraising.
- Identifying voids in the services provided.

If such data were compiled in a uniform manner across companies/institutions in a given industry, community, and/or region, researchers, planners, policy analysts, and policy-makers would have a better grounding for their efforts.

In primary [social science] research, data are collected by asking people questions or observing their behavior. In research synthesis, data are collected by conducting a search of reports describing past studies relevant to the topic of interest, Cooper [8].

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