R&D Capability of High-Tech Enterprises
within a
Dynamic Standardization Environment
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Abstract
The development and protection of standardizable technology and related core knowledge has become major concerns of high-tech enterprises (HTEs) in nowadays dynamic standardization environment, thus HTEs need to ensure their R&D capability embraces effective processes for standards-setting, upgrading and displacement. This paper proposes a framework for R&D capability of HTEs within a dynamic standardization environment with five elements being identified as particularly critical: - R&D planning, internal R&D practices, external cooperative R&D activities, coordination between internal and external activities, and IPR management. This is an attempt to enlighten HTEs on allocating their R&D resources appropriately and adopting proactive steps in any future standardization developments.

Keywords: High-Tech Enterprises, R&D Capability, Technical Standards, Innovation

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1. INTRODUCTION

With the rapid development of high-tech industries such as mobile communications and media technologies, the technological environment of enterprises has substantially changed. Demand for compatibility and interoperability of various technologies, as required by new technical standards, are challenging various technological capabilities possessed by individual HTEs. Simultaneously, HTEs have recognized that the dominant game rule of standards ‘wars’- ‘winner takes all’- and the tendency of closer combination of technical standards and patents, both lead to subsequent huge monopolistic profits, strong bargaining power in international co-operation networks and a dominant position in international trade. In addition, the continuous succession, or the potential complete substitution, of standards demanded by markets, technology progress and by promotions from international standards organizations all together have driven numerous HTEs to be dedicated to the development and protection of standardized technology and related core knowledge.

R&D capability refers to enterprises’ ability to reframe the present knowledge and produce new knowledge (Fleming 2001, Henderson and Cockburn 1994, Kogut and Zander 1992) and has been identified as one of primary competences for distinguishing between successful and unsuccessful HTEs (Bettis and Hitt 1995, Teece 1982), so it is vital for them to take a role in the formulation of new standards. Therefore, clearly aware of the prominent significance of standards, current HTEs
need to ensure their R&D capability embraces effective processes for standards setting, upgrading and displacement.

This paper is an attempt to understand and configure the core elements of R&D capability within a dynamic standardization environment, and to enlighten HTEs on allocating their resources appropriately and adopting proactive steps in any future standardization development. The remainder of the paper is structured as follows. First, five core essentials of R&D capability in a dynamic standardization environment are discussed. Next, the methodology applied in the future empirical analysis is elucidated. Finally, conclusion ends the paper.
2. CORE ELEMENTS OF R&D CAPABILITY IN A DYNAMIC
STANDARDIZATION ENVIRONMENT

The core elements referred to above principally include R&D planning, internal R&D
capability, external cooperative R&D capability, R&D coordinating capability and
IPR management. Each will be now discussed in turn.

2.1 R&D Planning

Song (2007) pointed out that to optimize corporate investment and related R&D
activities, identification of clear goals should be included into effective R&D planning.
As to standardization-oriented R&D activities, R&D planning mainly concentrates on
choice between compatibility and incompatibility of future technologies and the
patenting choices of potential R&D outcomes.

2.1.1 Choice Between Compatibility and Incompatibility

Compatible or incompatible elements within the existing dominant design depend on
HTEs’ resources and competences. If enterprises choose to break the technological
path of the current dominant standard, one of their key tasks is to reduce the
uncertainty and ambiguity of the new technology and its markets. On the other hand,
if compatibility is preferred, HTEs must choose, at the outset, which standard or
standards they wish to adhere to.

2.1.2 Patenting Choices of Potential R&D Outcomes

Here the patent choice refers to either basic patent or subservient patent. Choice is not
only constrained by which category of patent, but also by deliberate combination of both basic and subservient patents. Thus, three options are available.

(i) Develop basic patents to achieve monopoly power over related technology and markets.

(ii) Exploit subservient patents around others’ basic patents and threaten their owners by aiming to reach an agreement to mutual license at an appropriate price.

(iii) Exploit subservient patents around one’s own basic patents to construct a tight patent net to prevent others from developing related subservient patents.

In order to avoid the duplication of existing R&D outcomes and the infringement of patented technology, examine and verify the value of R&D projects as well as track patenting activities of rivals, patent searching and analysis are implemented by retrieving related patent literature, archives and other materials. Generally, HTEs usually assign this task to patent lawyers or external patent agencies.

2.2 The Internal R&D Capability

Despite ‘out-sourcing’ is prevailing, HTEs’ core competence is embedded in internal R&D capability distinguishing one from another. The race to be first patentee and the selection and acquisition of knowledge are key elements to this internal R&D capability.

2.2.1 R&D Races

Basic patents associated with new standards are the source for potential monopolistic
profits. So solving basic technical challenges through R&D and linked patents becomes a competitive race between standards-driven HTEs. Thus R&D races are effective competitions between HTEs to covert their R&D output into the first basic patents. The intensity of these races will be dependent on R&D time spans and deadlines, the quality and quantity of patents obtained and the level of internal R&D resources devoted to that endeavor.

2.2.2 Knowledge Selection and Acquisition
The limited resources and incomplete information normally lead R&D efforts to select a certain orientation. The R&D input and the selection of self-owned knowledge have great impact on the R&D competence and thus make the internal R&D capability of different enterprises uneven. As a result, the cultivation of internal R&D capability should emphasize the selection process of developing and acquiring knowledge.

2.3 External Cooperative R&D Capability
Standards embrace a group of technologies characterized by high complexity and integration to which cooperative R&D is an effective R&D mode in tackling key problems. Cooperative R&D capability is primarily dependent on the partnering, participation of users and R&D network management.

2.3.1 Partnering and User Participation
The purpose of selecting partners is to identify those who are capable of undertaking relevant R&D and developing standards. The criterion for partner selection is divided into two aspects. One relates to the HTE’s qualities that chiefly comprise the
capability of developing relevant R&D knowledge and associated patents. The other is to do with the building of relationships with partners who involve such attributes as compatibility, complementarity, reliability and adaptability. Jakobs et al. (1997) pointed out that in an increasingly competitive standardization environment, user participation can substantially improve the possibility of success for a new standard in the marketplace.

2.3.2 Management of R&D Networks
There is an increasing tendency for R&D networks to be integrated within cooperative standardization processes. An effective R&D network management can be achieved through two ways: i) management over the whole networks, which emphasizes the control modes and selective mechanisms; ii) management on each stakeholder’s participation in networks and attempts to solve inter-firm conflicts.

2.4 R&D Coordinating Ability
Reger (1999) states that many scholars support coordination plays a vital role in most approaches to organizational theory as a complement to differentiation. R&D coordinating ability is here understood to mainly embody both the allocation of funds between internal R&D and cooperative R&D activities and also the distribution of benefits among cooperative R&D members. Firstly, the distribution of R&D fund among the internal R&D and cooperative R&D activities will govern the target selection of R&D as well as the effort level, and exert far-reaching influence on the technological competitive edge in the future. In a similar vein, profits gained from standards-oriented cooperative R&D activities need to be fairly divided between the
cooperators according to agree ratios.

2.5 Intellectual Property Rights (IPR) Management

Intellectual Property Rights (IPR) are crucial intangible assets of HTEs that accrue significant rewards for R&D investment. To establish and maintain competitive advantage and thus maximize profits, appropriate patent strategies and rapid patent application are two priorities in IPR management.

2.5.1 Patent Strategies

For innovative HTEs, patent strategies, as part of wider innovation strategies, can be essentially divided into two types: offensive and defensive (Freeman et al, 1997).

For the offensive patenting HTE, patents are rapidly sought in order to protect their technological lead and to retain their monopolistic position. Thus their patenting tactics will be to ensure their basic patents are as ‘watertight’ as possible in trying to prevent competitors bypassing or leapfrogging their leading position.

In contrast, tactics of a defensive strategy will be aimed at ensuring that the HTE is not excluded from the technological race with rivals by using its patents pool as a bargaining counter in attempting to weaken any monopoly and retaining as much flexibility as possible (in resources and expertise) in responding to rivals’ tactics.

2.5.2 Patent Application

The capability of rapid patent application revolves around a HTE’s motivation and superior position to gain the first basic patent in a new technical field. Such a
capability may well necessitate in-house legal expertise in order to provide rapid intelligence on patent positions (via regular searches, etc) at both national and international levels. This will aid the determination of the strategies adopted for patenting and help define the scope of the patent position.

3. METHODOLOGY

The methodology of the part of empirical investigation is case study-based and it will be focusing on one selected leading Chinese HTE. At the present stage, the source of gleaned material is from secondary documents, such as online reports, official publications, etc. As the research proceeds, more detailed and comprehensive information will be collected via interviews and primary documents. The aim of the case study is to test the proposed conceptual framework and examine if the selected firm engaged in a dynamic standardization environment has adjusted the core elements of its R&D capability to meet the challenge imposed by changing external circumstances.

In the context of pressure from a dynamic standardization environment, the focal HTE is a less sophisticated HTE from a developing country and with less accumulation of knowledge than its foreign competitors, therefore it may be a very good test to determine if the framework proposed in this paper is applicable to HTEs.
4. CONCLUSION

This paper proposes a framework for R&D capability of HTEs within a dynamic standardization environment with five elements being identified as particularly critical. It intends to highlight some critical activities of R&D capability in such dynamic circumstances that could assist HTEs in determining their appropriate balance of R&D activities. However, the framework needs to be further verified via empirical investigations and thereby its context can be further refined.
References


