Practicing Public Intervention in Collaborative Projects: Generalisation of Findings from an Empirical Study in Government-Owned R D

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Abstract. Public interventions of government-owned research and development organisations present a number of challenges exacerbated by continuous changes of industries' expectations in a turbulent economic climate. There is a need for overcoming the barriers of practicing collaborative projects in government-owned research and development organisations. Conducting a combined Delphi and Analytic Hierarchy Process approach in a case study reveals that the 'commercial value' orientation plan yields the highest impact score on innovation factors. Societal value, such as supporting collaborative projects, is ranked in the second place. This leads to a suggestion to increase the organisational responsibility in promoting public-private collaborative projects. Thus, the paper provides an illustrative generic model for deploying the combined Delphi and Analytic Hierarchy Process approach in other government-owned research and development organisations to further improve public interventions for sustainable innovation development.

Keywords: AHP, collaboration, Delphi, government-owned R&D, innovation.

1 Introduction

The current economic climate has had a substantial impact on organisations worldwide. A risk-averse company concentrates on short-term benefits, and opposes to long-term high risk innovation projects. Some studies suggest that smart anti-crisis strategies should balance between shot-term and long-term investments; innovation will be the key for managing the economic downturn and providing long-term sustainable economic growth in both micro and macro economic environments. Furthermore, public intervention focusing on innovation at the governmental level is essential for fostering long-term growth [1], [2]. The role of government stimulates considerably innovation, for instance, establishing national innovation system (NIS) which states policy of governmental involvements in subsidising and encouraging collaborative projects, or even conducting government-owned research and development (R&D) in organisations [3], [4]. However, the questions of how and to what extent government-owned R&D organisations may contribute to national innovation need to be answered; for instance, how well does government-owned

R&D practice collaborative projects? There has been a growing awareness in a crucial role of collaborative networks in innovation performance. It is thus essential to reconsider the full spectrum of collaborative activities starting from planning, implementing, to assessing collaborative performance [5], [6]. However, a harmonised system of performance measurement for research activity is still being a controversial subject in both private and public R&D [7], [8]. Whatever the performance criteria for R&D, conceptual frameworks or models for managing R&D are essential for improving overall performance including research collaboration [9].

The purpose of the paper is two-fold: to provide a practical model for public intervention in research collaboration, and to provide an illustrative model for generic deploying the practical model in other government-owned R&D organisations. Thus, the paper first reviews public intervention in science and technology. A practical model for planning research collaboration designed for a national microelectronics centre is then presented. This is followed by generalisation of the practical model in other contexts. The final section draws out the contribution of the paper.

2 Public Intervention in Science and Technology (S&T)

Research collaboration has long been acknowledged by academics and policy makers as the key factor influencing innovation capability. Practicing collaboration could deliver several benefits: (a) economic benefits e.g. reducing cost, reducing time and reducing risk; (b) knowledge benefits e.g. academic excellence; (c) societal benefits e.g. satisfying collaborating stakeholders [6], [10]. Although private R&D could collaborate amongst its stakeholders, governmental intervention is needed. For instance, policies may be launched to stimulate public-private collaboration to share high risk of long-term innovation. However, many countries are facing barriers of transforming intervention policies into practices. Only increasing R&D expenditure is not sufficient to overcome the barriers; it is essential to reconsider all collaborative activities starting from policy formulation [2], [5], [11].

Barriers to research collaboration may occur at the phase of formulating collaborative networks, who is responsible for the leading role to ensure the momentum of collaborative projects? Should public sector such as government-owned R&D organisations play a leading role? Government-owned R&D could intervene in collaborative projects in different forms, such as technical consultant, marketing consultant, exchanging staff, joint research and funding. Thus, it has to select potential projects and make decisions over levels of involvement [5], [8], [12]. In addition, collaboration barriers could happen within organisations. Government-owned R&D carried out by public employees within governmental institutions, the organisational characteristic combines the culture of public organisations and the nature of employees in research organisations together. Thus, the organisation needs collaborative strategies that promote collaboration. Unclear strategies are obstacles to collaborative processes; for example, time-limited policies may constrain consulting activities which are time consuming work. The goals of collaboration should be stated in project selection criteria and evaluation systems [6], [13]. Furthermore, some government-owned R&D organisations may be confronted to human-related barriers;

researchers may not perceive organisational goals and fail to realise the necessity of public-private collaborations. Individual and organisational benefits form collaboration should be stated in performance evaluation system to shift the culture of pursuing self-interested research to collaborative research [11], [13].

3 Practicing Public Intervention in Government-Owned R&D

Most of existing studies involving collaborative research have been devoted to assessing performance of collaborative projects [14], [15]. However, a performance evaluation system measuring outputs at the end of a collaborative process may be not flexible enough to manage future innovation. Collaborative research should be managed at the first stage of planning policies and strategies. In addition, planning stage should take multiple dimensions of government-owned R&D into account to better overcome collaboration barriers [2], [9], [16]. Thus, the study of practicing public intervention in government-owned R&D was motivated by the lack of an integrative framework for managing research collaboration. However, managing R&D is a part-dependent process; it cannot be separated from local societies and national contexts within which the R&D is operated. Thus, there is a need for country-specific studies which allow for deep exploration of a particular phenomenon. Furthermore, practicing public intervention in developing countries, where technological innovation relies on government-owned R&D organisations, may present a clear perception of governments' roles in innovation systems.

The combined use of Delphi and Analytic Hierarchy Process (AHP) has been reported in existing literature to establish a practical model that can assist in innovation management planning [17]. Thus, the authors employed the approach to establish a practical model for planning research collaboration in government-owned R&D. The methodological framework is shown in Fig. 1. The first empirical study to refine gathered factors and to investigate other factors resulting from the expert panel's opinion was based on the Delphi method. A Delphi panel was assembled in a particular country to limit the effect of diverse panel implications across countries [18]. Thailand was selected because the country is an example of a developing country where major R&D is performed in universities and government-owned R&D organisation. Thailand is an interesting developing country; although the governmental funding has been assigned to government-owned R&D than private organisations, the contributions of government-owned R&D in driving the national competitiveness remain ambiguous. Practicing public intervention involving innovation policies of Thailand is considered weak [19], [20]. The multi-round questionnaires were distributed to experts working in different government-owned R&D organisations in Thailand such as electronics and computer technology, metal and materials technology, and genetic engineering and biotechnology centres. The Delphi consultation was concluded at the third round. A set of factors classified into four main dimensions – mission, internal R&D, collaboration and management – were accepted by thirty-three experts from Thailand as the influencing factors for managing Thai government-owned R&D organisations.

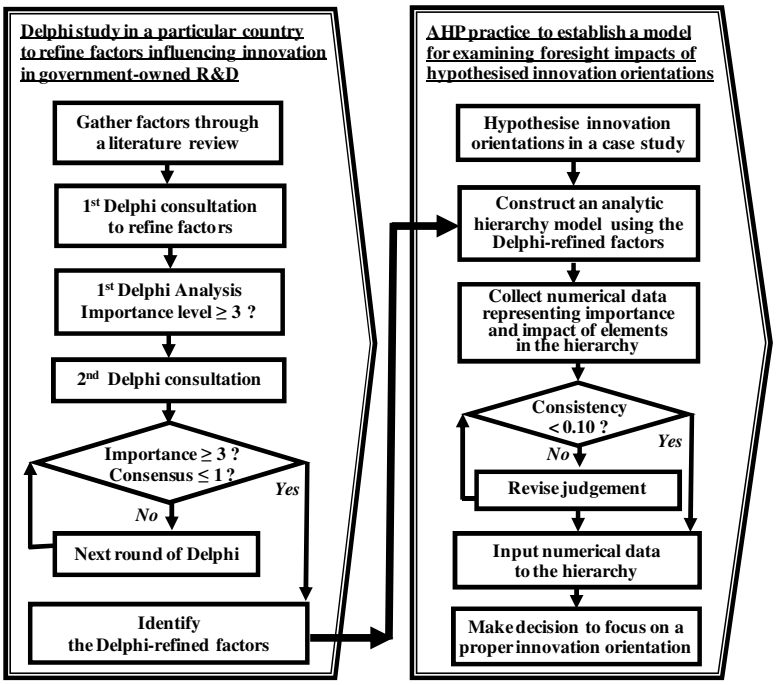

Fig. 1. A combined Delphi and AHP methodological framework

The second empirical study to establish a model was based on the AHP approach; at least one case study with specific circumstances is required to provide good insight into prioritising the factors. Additionally, a case study of which the organisational characteristic could represent the public intervention in collaboration research should be drawn from the country where the Delphi consultation was employed. The selected AHP case study (i.e. MEC) is the first and only microelectronics research centre in designing and fabricating integrated circuits in Thailand. MEC is fully sponsored by the Thai government to develop microelectronics prototypes that can be commercialised in the semiconductor world. It also collaborates with microelectronics industries by providing high investment infrastructures, technological consultations and research funds to promote research activities in all fields of microelectronics including nanotechnology. With noticeable infrastructures and human capital, MEC has the capability to practice public intervention involving the national innovation. However, MEC tends to conduct research projects without scoping innovation orientation; the top management approves projects which concern to any one of the missions. Under such circumstances, the decisions seem to be intuitions by nature; prioritising criteria still is quite vague. The AHP is thus conducted in MEC at the planning stage of innovation to examine sensible foresight impacts of different innovation orientations. To orientate the innovation plan of MEC, a pre-determined model was then constructed and discussed with top management resulting in a five-level hierarchy the first level (H1) of which is the goal to examine foresight impacts

of future innovation orientations (Fig. 2). The three lower levels (H2, H3 and H4) consist of the factors and sub-factors verified by the Delphi consultation and re-arranged by the top management to fit to the goal. The fifth level (H5) of the hierarchy is arranged for alternative orientations which are hypothesised orientations that are conceived by making assumptions about current and future trends of MEC. There are 3 orientations: (a) a knowledge orientation focusing on academic excellence; (b) a societal orientation focusing on collaboration and societal values; (c) a commercial orientation focusing on commercial values of research products. The importance priorities of factors and impact weights of alternatives obtained from the AHP study is shown in Fig. 2. Amongst three alternatives, the 'commercial orientation' has the highest score at 0.4871, while the score of 'societal orientation' and 'knowledge orientation' are 0.3369 and 0.1760, respectively. In addition, a sensitivity analysis of orientations was carried out to investigate whether any change in priority of any factor could make the societal orientation the most impact creating orientation on innovation. The societal orientation becomes the one with the most impact creating orientation on innovation when the priority of collaboration is more than 43%, whereas the original value is 9.42%. This leads to a suggestion to increase the organisational responsibility in promoting public-private collaborative projects [21].

4 Generalisation of the Findings from an Empirical Study

The findings from the empirical study in MEC can be generalised by replicating the study in multiple-case studies, or it can be applied to other situations. Even though the analytic hierarchy model is specifically designed for the selected case study, i.e. MEC, other government-owned R&D organisations can reap benefits from the Delphi-refined factors and the structure of MEC hierarchy model as illustrated in Fig. 3. For instance, other government-owned R&D organisations in Thailand, somehow share the similar culture and political environment. Thus, they can shorten the process of combining Delphi and AHP for innovation management by skipping the Delphi study. This is enabled by the set of innovation influencing factors by judgements of the experts from a broad research area of S&T in Thailand.

Although the results from this study are not directly usable in other countries, the factors gathered from research of government-owned R&D in developed and developing countries (the highlighted factors in the Fig. 2) can be used as candidate factors to be refined and validated by a Delphi and AHP study in the new selected country. The verified factors suitable to a particular country can be further applied to establish an analytic hierarchy model for innovation planning as described in the methodological framework of this paper. It may be argued that comparing influencing innovation factors across countries may add value to the current study. Nonetheless, the difference of culture and political environment (represented as the root of the AHP tree in Fig. 3) leads to the difficulty in comparing different (context specific) hierarchy models. The comparison across countries could be carried out by comparing the innovation competitiveness (represented as 'fruits' in the Fig. 3).

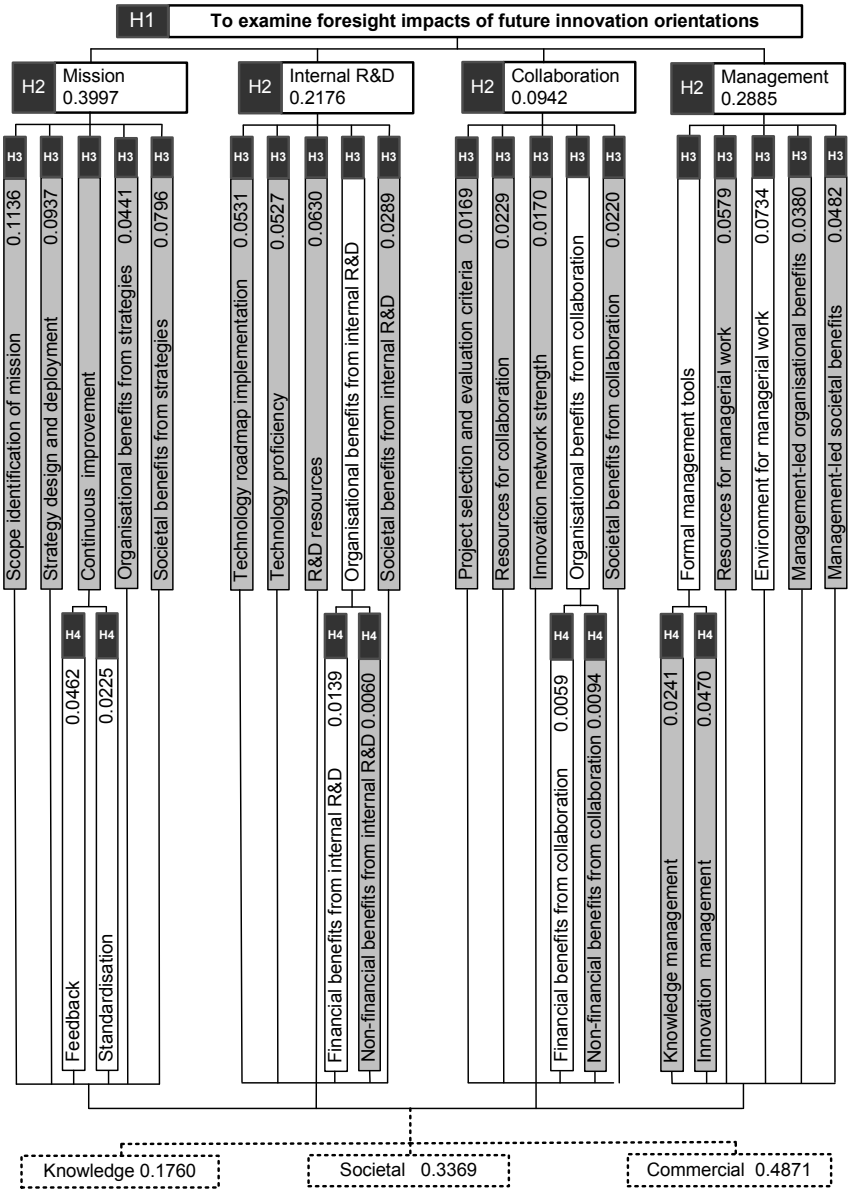

Fig. 2. An analytic hierarchy model for planning innovation orientation in MEC

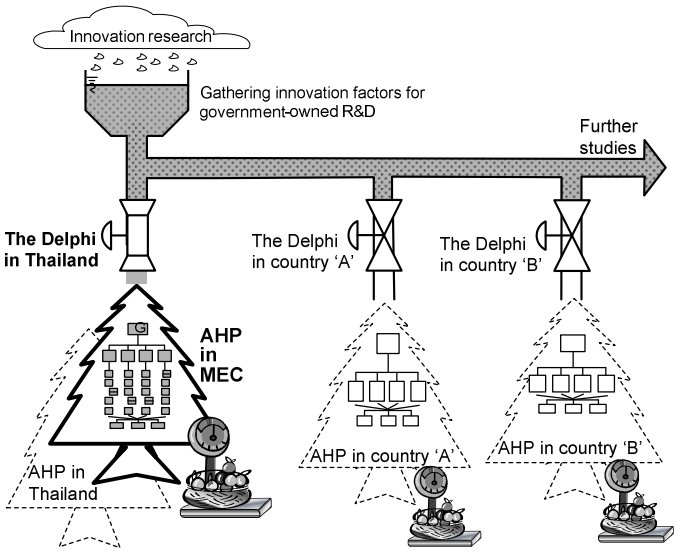

Fig. 3. An illustrative model for generic deploying a combined Delphi and AHP

5 Conclusions

The paper provides an analytic hierarchy model to assist a government-owned R&D organisation to plan national innovation by practicing collaborative projects. The model which considers not only factors in the collaboration but also the other dimensions of government-owned R&D, was designed for innovation planning in the early phase of formulating an organisational orientation. The model was established by conducting two empirical studies: the Delphi consultation using Thai experts from different government-owned R&D organisations, and the AHP applied in a Thai case study (i.e. MEC) which delivers public intervention in supporting long-term high risk innovation and involving the full spectrum of the innovation process. The study resulted in an authoritative model for examining foresight impacts of hypothesised innovation orientations in MEC: knowledge, societal, and commercial plans. Moreover, the paper provides an illustrative model to generalise the findings from the conducted empirical studies. The illustrative model suggests that adopting the Delphi-refined factors to construct new hierarchy models to select adapted innovation orientations in Thai public R&D organisations could help better develop a cohesive and strong national innovation system in Thailand. The illustrative model also guides government-owned R&D in other countries in adopting the methodological framework proposed in the paper to establish an analytic hierarchy model to better manage collaboration in R&D organisations. The authors hope that the present paper will contribute to the ongoing research aimed at managing government-owned R&D.

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