

SME technical Roadmap based on the hybrid-analysis technique

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1. Introduction

Decisions on valid time and factors to evaluate technology prospects are very important as well as methodology [1]. Qualitative approaches based on expert judgments and quantitative approaches based on patents and these have been used to choose promising industries and technologies. Qualitative approaches use Delphi based on expert evaluations, brainstorming, and expert FGI(Focused group interviews). These are frequently used to evaluate prospects. Research propensity, however, might arise because it is based on expert judgment [2]. Quantitative approaches generally use quantitative information analysis, trend monitoring, and correlation analysis; these are increasingly likely to be applied according to Big Data generalization.

In this paper, hybrid-analysis techniques and processes, which combine qualitative and quantitative methods for objectivity, are discussed and results and applications are suggested.

2. SME Technology Road-map(TRM) strategic field and Product selection

The strategic fields, drawn by analyzing domestic and foreign policy trends, technology leadership, possibilities of market growth, industrial and economic ripple effects, and SME suitability and support urgency, are rather comprehensive. To clarify a supporting field, we selected strategic products, a measure of a detailed technology group. For this analysis, we collated current situations including scope of strategic field, primary product, technology needs, industrial structure and supply chain management (SCM), market trends and size, domestic and foreign key player trends, technology trends, and SME R&D capability like Figure 1. This analysis was progressed quantitatively, based on objective references and various statistical data.

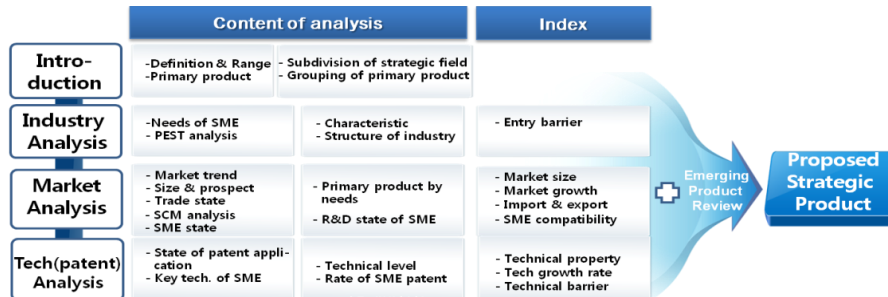


Figure 1. Quantitative analysis for the strategic fields and selection for strategic product

Next, we decided strategic products by qualitative analysis, by taking into consideration each industrial expert's technology and market evaluations and final judgment about SME character. At this step, we applied index and evaluation processes like Figure 2 to strengthen objectivity. We raised the accuracy levels of the final results by applying pair-wise comparison evaluation methodology using the AHP(Analytic Hierarchy Process) to improve the objectivity of the weighted value per item.

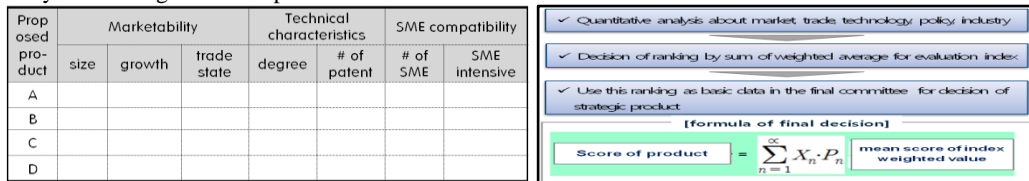


Figure 2. Evaluation index and process to select the strategic product

3. Decision of core technology about strategic product through hybrid-analysis

The 5-level hybrid-analysis method (Figure 3) was applied for strategic product drawn from the above process. Qualitative analysis was composed of 1-4 stages. Patent and thesis analysis through data sampling, keyword clustering, the elicitation of element technology through high-frequency (related) keyword analysis, and the arrangement of tree and element technology were conducted. Qualitative analysis, such as expert verification and investigation about generally accepted standard technology naming, was conducted simultaneously.

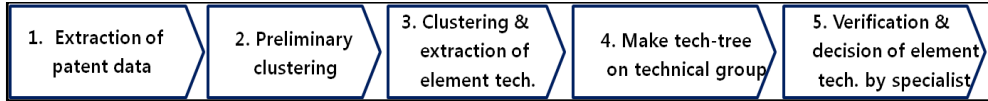


Figure 3. Hybrid-analysis for element technology elicitation

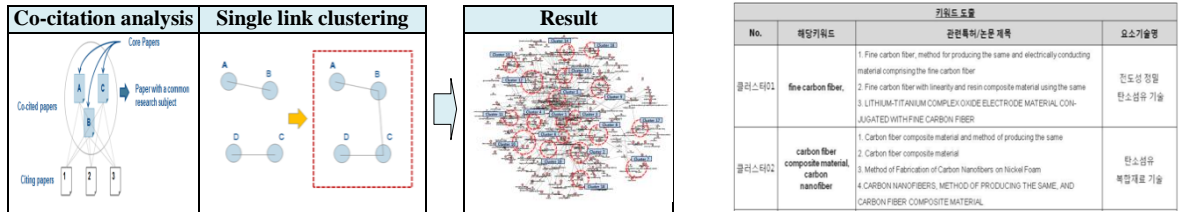


Figure 4. Clustering method and example of core elemental technology

We especially drew an element technology candidate through applying for co-citation analysis to measure core patent similarity and Single Link Clustering at a similarity level. At the 5th level, we applied for a hybrid index by considering both quantitative and qualitative results and we drew a final element technology.

Sect	Elemental technology	Recommender	Technical property		Marketability		SME compatibility		Policy coincidence	Selection (00)
			degree	tech. growth	size	growth	participation level of SME	entry barrier		
Strategic product	tech. A	specialist								
	tech. B	patent & paper								
	tech. C	needs of SME								

Figure 5. Evaluation index of elemental technology

4. Conclusion

In this paper, we suggested an optimized hybrid-analysis method for SME TRM, by our combining quantitative and qualitative methods for prospect technology estimation. Korean SMEs' satisfaction levels and degrees of practical usage information about TRM drawn through the above result are like Figure 6. The satisfaction measurement of 82.8% is very high. The application index represented is primarily used to understand technology, industry, and market trends. However, it is used relatively less for the establishment of technical commercialization strategy and technical investigation.

To complement this, we plan to continually develop TRM by building a more specific data system and reflect technology consumers' concrete demand. TRM for SMEs in Korea is expected to provide opportunities to jump up to be Global First Mover, not a Follower anymore, with SMEs that want to develop R&D by intensifying core capability and reliable future technology prediction.

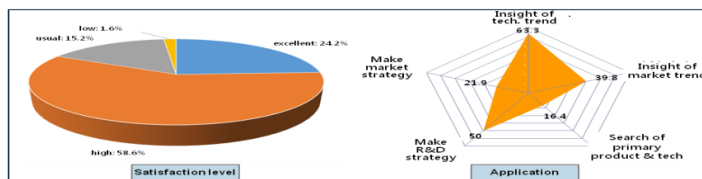


Figure 6. Satisfaction level and practical use industry for SMEs TRM[3]

5. References

[1] Kostoff, R, N. (1994) "Assessing research impact: US. Government retrospect and quantitative approaches." Science and Public Policy, 21(1): 13-22
 [2] Chubin d. El, Hackett E. J. (1990), Peer review and the printed word. In: Chubin DE, Hackett E. J. Peerless Science: Peer Review and U. S. Science Policy. Albany, NY: SUNY Press.
 [3] SME R&D Roadmap in korea, 2014, KEIT, SMBA