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Designing Non- Financial Support Packages for Science and Technology Parks Based on Services Depending on the Technology Readiness Level (TRL) Using The SWARA Method

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Abstract

Technology-based firms face many challenges at the start of their activities, which multiply their need for support. Therefore, providing services to them based on their main feature, i.e. technology level, will lead to the purposeful use of limited available resources. In this study, we identified six groups of services required by the firms located in science and technology parks (STP), including financial, knowledge, management, welfare, marketing and legal services. This groups of services were divided into 35 subgroups based on library studies and interviews with experts *and* a needs assessment survey from *the firms* located in Tarbiat Modares Science and Technology Park. The correlation between technology readiness level (TRL) and services required by the firms was tested. Based on the results, the technology readiness level correlates with five groups of services, except financial services. In order to design the support packages, we used Stepwise Weight Assessment Ratio Analysis (SWARA) method to weight the five service groups in the first stage, and 35 subgroups of services in the second stage. According to the results, the most service groups required by the firms based on TRL1-3, TRL4-6 and TRL7-9 are respectively knowledge services, legal services and marketing services.

Keywords: Technology Readiness Level (TRL), Needs assessment, Support Package, Science and Technology Parks, SWARA Method

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Introduction

The Interviews conducted prior to this research revealed that a significant challenge for managers is the allocation of services to the applicant companies in the science and technology parks. This research was initiated in response to the needs of STPs managers to deal with such a problem.
In this research, the Technology Readiness Level (TRL) is considered as a criterion for classifying the firms located in science and technology parks. Also, the SWARA method has been used to prioritize services. Unlike other multi-criteria decision-making methods, the SWARA method has been employed to prioritize services, requiring fewer pairwise comparisons (n comparisons) to rank criteria efficiently.

Methodology

The study's statistical sample is the firms located in the Tarbiat Modares Science and Technology Park. This STP hosts 131 firms and innovative units in seven technology categories. The research employed library methods to gather historical data and Data collection surveys to collect information from the targeted group.
Data collection involved two methods: direct interviews and self-reported data. Following data collection, hypothesis testing was used to assess the correlations between firm needs, their field of activity, and Technology Readiness Level (TRL). Finally, services required by firms were ranked using the SWARA method within a multi-criteria decision-making framework.

Findings

Since the Technology Readiness Level (TRL) variable (with 3 categories) and the field of firm activity (with 5 categories) do not follow a normal distribution, Spearman's test was used to evaluate the research hypotheses. The results indicated no statistically significant relationship between a firm's field of activity and any of the identified services ($p \geq 0.05$).
While the relationship between TRL and financial services is not statistically significant, other services are significantly correlated with TRL at a 95% confidence level. Based on the data analysis, the support packages should be tailored according to the Technology readiness level for each hosted firm by the STP.

Conclusions

The analysis revealed distinct preferences at each Technology Readiness Level (TRL), indicating that the firms have varying needs as they progress through different stages of growth. This variation in needs affects their prioritization of support services. To address this, managers can use two formulas that prioritize categories and sub-categories of services to allocate resources effectively according to the park's limitations.
The budget allocation for each TRL and service category is calculated as follows.
Calculate the budget share for each TRL in each service category using Formula (1):

$$A_{mn} = \frac{W_{mn}}{\sum_{n=1}^{3} W_{mn}}$$

where A_{mn} represents the budget share for the n-th TRL in the m-th service category, and W_{mn} is the weight of the n-th TRL for that service.
Determine the budget for each sub-criterion within the service category using Formula (2):

$$B_{hn} = \frac{W_{hn}}{A_{mn}}$$

where B_{hn} represents the budget share for sub-criterion h within the n-th TRL, and W_{hn} is the weight of sub-criterion h for the n-th TRL, calculated using the SWARA method.

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