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Factors Influencing the Performance of Technology Commercialization in the Context of PFROs: a SEM based Approach

Sandeep Singhai[1,2,3], Ritika Singh[1]*, H K Sardana[3,4] & Anuradha Madhukar[3,5]

[1]CSIR-Central Scientific Instruments Organisation, Sector 30 C, Chandigarh 160 030, India

[2]CSIR-Advanced Materials and Processes Research Institute, Hoshangabad Road, Bhopal, Madhya Pradesh 462 026, India

[3]Academy of Scientific and Innovative Research (AcSIR), Ghaziabad 201 002, India

[4]Indian Institute of Information Technology Raichur, Transit in Government Engineering College (GEC),Yermarus Camp, Raichur, Karnataka 584135, India

[5]International S&T Affairs Directorate, Council of Scientific and Industrial Research, Rafi Marg, New Delhi 110001

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Development and validation of an innovative model for the technology commercialization performance through confirmatory factor analysis was attempted in this study. Commercialization of technologies developed in the PFROs of a developing country and offered in the market by the industry was the primary focus. Based upon this, a TCP Model was proposed for the performance of technology commercialization. The empirical analysis uses a reliable and valid questionnaire administered to the purposefully sampled respondents of about 50 Indian PFROs with 254 responses. The developed conceptual model was analyzed using a structural equation model and was evaluated for the goodness of fit. Six factors such as; national policy support, transferee characteristics, transferor characteristics, technology absorption, and adaption capabilities, sectoral infrastructure, and contextual environment are positively correlated with the performance of technology commercialization. The results indicated the primacy of transferee characteristics in conjunction with contextual environment, technology absorption and adoption capabilities, sectoral infrastructure, and transferor characteristics for the performance of technology commercialization with national policy support playing a supporting role. The traditional sectors of agriculture, strategic, bio-medical, and some new areas such as waste management and nanoscience were covered in this study.

Keywords: Technology Transfer, Innovation, Technology commercialization, Public funded research organisation, Structural equation model

Introduction

Developing and emerging economies like India aspire to achieve economic growth and transform into manufacturing hubs. To achieve these objectives, an impetus is required in terms of policy, strategy, and tactical support.[1] To support manufacturing and harness the power of technologies, an agile R&D sector is necessary. In this pretext, Public Funded Research Organisations (PFROs) need to position themselves to cater to these demands[2] being important constituents of the innovation system.[3] In developing countries, market forces are insufficient to establish major technology sectors, and public interventions are required.[4] Moreover, the literature of the past two decades suggests that the public research investment allocation is mainly for the PFROs, strengthening their role.[5] Further, the role of PFROs as an enabler for innovation has been exhaustively analyzed using a case study approach in high-tech regions of developed economies.[6]

Technology commercialization is defined as the process of flow of technology from a laboratory to the market as a product through contributing industrial innovation.[7] The 21st century witnessed an acceleration in technology commercialization activities globally.[8] Despite horizontal technology commercialization in developing countries, the research therein has traditionally been influenced by the problems the Western world faces. This has been a chronic issue, with indigenous inventions rarely being useful for industries to commercialize.

The topic of commercialization of technologies from public laboratories has been studied in the literature under various contexts, and the challenges have been discussed.[9] Markman *et al.* had raised research questions regarding technology commercialization at the individual, organizational, and technology levels while

*Author for Correspondence
E-mail: ritikasingh@csio.res.in

indicating the paucity of literature regarding the performance of the technology commercialization process.[10] Rybnicek & Konigsgruber identified the factors with suggested managerial implications and explored the scope of work in technology commercialization research by identifying moderating factors that require in-depth research.[11]

In the Indian context, Purushotham *et al.* developed a Structural Equation Model (SEM) for the transfer of technologies from public laboratories and identified characteristics of transferor & transferee, national policies, funding sources, and market demand as critical enabling factors.[12] Singhai *et al.* developed a framework model for the transfer of technology, validated it using SEM, and identified quintuple of success factors.[13] Thyagaraju *et al.* reviewed the technology transfer literature and highlighted the benefits of technology transfer and its spillover for society.[14] However, these studies are limited to the aspects related to the transfer of technology with little emphasis on post-transfer efforts necessary for innovative offerings by firms in the market, which is an area of concern.

Bong *et al.*, while examining the technology commercialization process for start-up firms using SEM, highlighted a gap in an end-to-end mechanism to ensure technology transfer leading to innovation through technology commercialization success.[15] However, their work was focused on the efforts of start-ups. Similarly, Min *et al.* examined the commercialization by private industries and its impact on their business growth.[16] Thus, the literature has not examined the holistic facilitation of technology commercialization from PFROs. The discussion indicates the need for a validated, comprehensive model for technology commercialization performance from the PFRO perspective in developing countries, and this paper is a contribution in this regard. A conceptual model is required for PFROs to formulate policies based on the understanding of the decision-making units. This paper aims to develop a quantitative framework for technology commercialization performance. The work evolves the causal relationship of contributing factors towards the performance of technology commercialization through developing a conceptual model and validating it through confirmatory factor analysis in the context of PFROs in a developing and emerging country.

A conceptual framework to provide a perception-based model has been proposed. The model identifies the factors and their interconnectedness that play a key role in the performance of the Technology Commercialisation (TC) process. The context is of Indian PFROs covering the agriculture, bio-medical, waste management, strategic, and nano-science sectors. The model has been empirically validated using a Likert-based questionnaire and SEM. The paper's contributions are identifying factors affecting TC performance, developing a holistic model for TC performance in developing countries, and empirical validation using SEM analysis.

Conceptual Background

National Policies are essential drivers for technological innovation and commercialization of technologies from PFROs.[17] Offering fiscal incentives promotes effective partnerships between PFROs and industry.[12] According to Friedman *et al.*[18], promoting faculty involvement in technology commercialization activities leads to greater licensing contracts and enhanced income.

The presence of well-equipped laboratories is vital for technology development and commercialization.[19] For a firm, the capability to innovate depends on imbibing and internalizing the adopted technology, thereby leading to profits.[20] The innovation capability is advantageous for the commercialization of innovative products.[21] As the migration of the developed technology to the market is challenging, the marketing capability of the transferee is crucial.[22] Licensing conditions also play a role in the successful commercialization.[23] Technology commercialization fails due to a PFRO's lack of understanding of market needs. A Technology Transfer Office (TTO) can help pool resources from different units and enhance the probability of successful commercialization.[24] Further, Brecovitz *et al.*[25] have stressed the importance of organizational structure in the universities for establishing linkage with industry. Legal expertise is useful in handling intellectual property issues and risk management.[26] Personal exchanges/ communication between stakeholders in the technology commercialization process promotes effective relationships[27], enhancing mutual trust[28] and better knowledge transfer.[29] The Geographical proximity of the industry with the PFROs provides the unique advantage of better face-to-face interactions, socialization, and coordination among the stakeholders.[30]

Researchers identify innovations in technology adaptation, economic conditions, technological infrastructure, and R&D resources as critical for successful commercialization. According to Kim and Ko[31], infrastructure is an important factor for judging the fate of technology commercialization. O'Shea

et al.[32] have considered the infrastructure for their study as the geographic location is an important aspect for the contributions of university-based research. Li *et al.*[33] found that the entrepreneurial experience impacts the capability of firms to identify new opportunities and capitalize them affirmatively.

The commercialization environment depends on several market and non-market factors like technology cost, replacement speed, product differentiation, promotion by the government, and market access.[34] The presence of enabling features like healthy entrepreneurial culture, communication, networking, and handholding facilitates commercialization.[35] The involvement of manufacturing staff in the TC process, though brings in the benefits of cross-functional skills, requires a cautious and timed approach with effective harmonization of diversity being an important aspect. It requires a balanced approach with appropriate communication and is usually imbibed in the culture of the firm and mutual trust between stakeholders.[36] According to Kirchberger & Pohl[7] networking activities are vital factors for commercialization success.

Hausman[37] stated that the rate and pace of adoption of new technologies by the receiver can greatly impact the commercialization process. Adaptation and absorption capabilities play a significant role in technology transfer projects. Successful commercialization depends on the extent to which the receiver internalizes the crux of the technology, absorbs and adapts it for business gain.[38] According to Sun *et al.*[39], the appropriability and innovativeness of the technology positively influence commercialization. Academicians have shown that weak appropriability leads to economic and competitive disadvantages. Since technology commercialization efforts represent a firm's creative experimentation, hence its innovativeness has a key role to play.[40]

Kim *et al.*[41] defined technology commercialization performance as an indirect and long-term occurrence resulting from the success of technology and creating value-addition from technology development. In the past, the performance of TC has been largely studied in the literature[41,42] measuring the technical, financial, regional, and economic performance factors for success in developed countries. Moreover, SEM has been used by researchers to develop frameworks for TC Performance in various contexts.[43]

The foregoing discussion helps identify several important elements that have a potential causal effect on the performance of the technology commercialization process. These observable elements are grouped into six latent factors and develop a conceptual framework to represent the relationship and their impact on the outcome technology commercialization performance. The identified latent factors are categorized as national policy support, transferee characteristics, transferor characteristics, sectoral infrastructure, contextual environment, technology absorption capabilities, and one outcome factor, TC Performance. The proposed TCP-PFRO model is shown in Fig. 1.

The latent factors affecting TC are shown at the circumference of the model as the constructs while the outcome factor, TC performance been depicted in the center. The model contributes to the understanding of the distinguishing factors for TC performance of PFROs working in the agriculture, bio-medical, waste management, strategic and nano-science sectors.

National policy support is important for PFROs in developing countries as the primary source of funds and directions are government policies and grants. The laws governing a country directly as well as indirectly affect the decision making related to inter-organisational transactions and especially technology commercialization that is crucial for the economy of the country. Successful TC is a challenging endeavour due to its characteristic uncertainties and success is elusive even with the availability of finance and expert management support. To overcome these uncertainties, the current study postulated that the technology absorption capabilities are vital for facilitating the commercialization of technologies. Embeddedness with appropriate articulation and innovativeness facilitates TC in the presence of absorptiveness and intention.

Further, the transferee and transferor characteristics are important for the transfer of technology in the TC context as well as the organizational and managerial context at both individual and institutional levels. The transferee characteristics that include the management structure, R&D structure, leadership, knowledgebase etc. are crucial because the technology has to be sold in the end and it is only possible if these factors are in favour. The transferor characteristics such as organisational setup, flexibility, internal communication, funding, legal expertise etc. are particularly important because the transferor has to do the handholding and ensure that the developed technology is given to the transferee with utmost commitment towards its success. Although the Transfree Characteristics include all the parameters relevant to any organisation but in this model the Technology Absorption Capability is shown as one

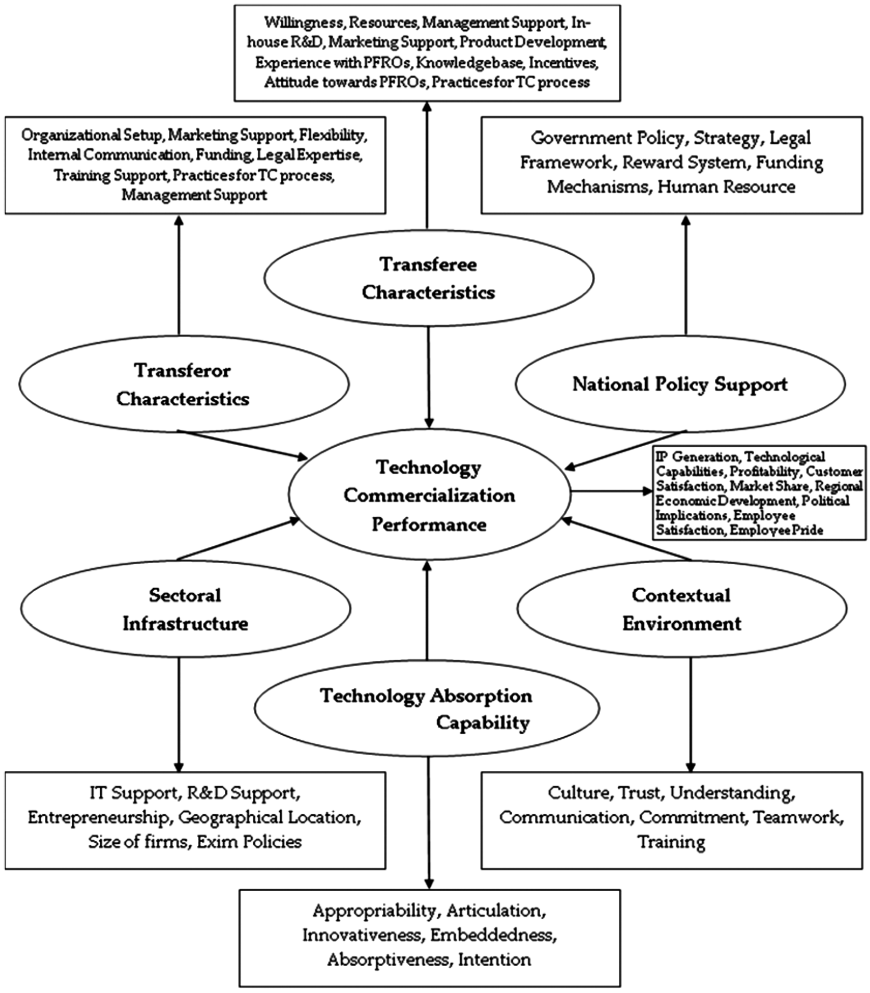

Fig. 1 — Technology commercialization performance-PFRO (TCP-PFRO) model

of the pillars playing a role parallel to the Transferee Characteristics since this capability is explicit to the output parameter i.e. Technology Commercialization Performance. The contextual environment i.e culture, trust, understanding, communication, teamwork etc. is important in the geographical context especially since the uncertainties involved in the process can be overcome well within time if these factors are supportive. The sectoral infrastructure i.e. IT support, R&D support, entrepreneurship, location, size of firms etc. is different for varied sectors and hence its role in the technology commercialization performance will vary with the sectors under study. Holistically the model depicts the factors that impact the complex process of TC. It also highlights the policy, contextual and sectoral dependence of the technology commercialization process. The six factors and their parameters influencing Technology Commercialization Performance are illustrated in Fig. 1 below.

Research Methodology

The present study used an exploratory research method[44], in which primary data was collected through a survey instrument. Relevant literature and domain knowledge was used to design the questionnaire. This study adopted the cross-sectional survey design approach[45] and used purposive sampling.[46]

To ensure the validity of the survey instrument[47], it was subjected to a thorough review by a group of experts to identify repetitive items, ambiguous statements, confounding variables, rewording confusing statements, and adopting uniform language throughout the questionnaire. The population was approximately 1000 and consisted of respondents, including developers and promoters who are either familiar with or directly involved in technology commercialization activities in 50 PFROs pan-India. The target sample was approximately 350.

The SEM approach has been used for the confirmatory factor analysis to evaluate the causal relationships and validate the conceptual model. Although the minimum sample size determination for adequate model fit and power is complex but is essential for the reliability of parameter estimates, model fit, and equation statistical power. The literature recommends a minimum sample size of 100-200 when using the maximum likelihood estimation procedure.

The developed survey instrument had eight sections. The initial section collected demographic information on the respondents of the study. The next section focused on national policy support, measuring four elements: legal framework, reward system, funding mechanisms, and human resources. The subsequent section focused on the transferee characteristics, measuring eleven elements viz. willingness, resources, management support, in-house R&D, marketing support, product development, experience with PFROs, knowledgebase, incentives, attitude towards PFROs, and practices for TC process. This was followed by a section focussing on the transferor characteristics, measuring nine elements: organizational setup, marketing support, flexibility, internal communication, funding, legal expertise, training support, practices for the TC process, and management support. The fifth section focuses on the sectoral infrastructure, measuring six elements: IT support, R&D support, entrepreneurship, geographical location, size of firms, and Exim policies. The sixth section focuses on the contextual infrastructure, measuring seven elements: culture, trust, understanding, communication, commitment, teamwork, and training. The seventh section focuses on the technology absorption capabilities, measuring six elements: appropriability, articulation, innovativeness, embeddedness, absorptiveness, and intention. The last section focuses on measuring the TC performance.

Data Analysis and Validation

The data collection was done between February 2020 and March 2020 via an online survey. The instrument was distributed via email, followed up by telephone and email.

Demographic Analysis

A total of 254 respondents participated, representing all the 50 PFROs considered in the study. The demographic characteristics of the survey respondents are shown in Table 1.

Table 1 — Demographic profile of respondents (N = 254)

Variable	Category	Frequency	Share (%)
Gender	Male	212	83.0
	Female	42	17.0
Age (years)	Up to 30	8	3
	31–40	78	31
	41–50	106	42
	Above 50	62	24
Educational qualification	Graduate	18	7
	Post-Graduate	112	44
	Doctorate	124	49
Experience in TC	Up to 5 years	17	7
	5–10 years	69	27
	Above 10 years	168	66
Sector	Agriculture	84	33
	Bio-Medical	35	14
	Waste Management	13	5
	Strategic	56	22
	Nano Science	28	11
	Others	38	15

The study aimed to elucidate in-depth information on the TC from PFROs in the context of developing countries. Accordingly, the study considered those respondents who had sufficient experience in the domain as they better understood the research problem. One-way ANOVA and independent sample t-test were performed to ascertain sample integrity. It confirmed that respondents of different demographic profiles regarding TC and sectors could be considered a single sample. The validity of the demographic variables was confirmed using statistical analysis with a 0.05 level of significance.

Descriptive Statistical Analysis

Descriptive Statistical Analysis was done for National policy support, transferee characteristics, transferor characteristics, sectoral infrastructure, contextual environment, technology absorption capabilities, and technology commercialization performance, as shown in Table 2.

It can be observed from Table 2 that communication is the top-rated sub-factor impacting technology commercialization performance with (M = 4.26, SD = 0.83), followed by commitment (M = 4.25, SD = 0.82). Teamwork (M = 4.21, SD = 0.84) and Understanding (M = 4.19, SD = 0.82) and Trust (M = 4.07, SD = 0.88). The least rated one's are funding mechanisms (M = 3.31, SD = 0.97), and incentives (M = 3.34, SD = 0.98).

Table 2 — Descriptive statistical analysis (N = 254)

	Mean	SD	Skewness	Kurtosis
National Policy Support	3.3780	0.76766	−0.701	1.115
Legal Framework	3.4331	0.77603	−0.516	1.033
Reward System	3.4134	0.96499	−0.723	0.436
Funding Mechanisms	3.3071	0.97407	−0.494	−0.003
Human Resource	3.3583	1.04522	−0.446	−0.272
Transferee Characteristics	3.6741	0.59140	−0.980	3.576
Willingness	4.0197	0.90432	−1.009	1.208
Resources	3.9567	1.03405	−1.145	1.159
Management Support	3.8780	0.98850	−0.866	0.603
Inhouse R&D	3.7756	0.99843	−0.786	0.336
Marketing Support	3.5787	1.00183	−0.718	0.112
Product Development	3.6575	0.86933	−0.611	0.580
Experience with PFROs	3.7283	0.87625	−0.685	0.836
Knowledgebase	3.8976	0.87418	−0.909	1.216
Incentives	3.3386	0.97980	−0.163	−0.252
Attitude towards PFROs	3.8081	0.69915	−0.794	2.689
Practices for TC Process	3.4822	0.65096	−0.509	0.984
Transferor Characteristics	3.8283	0.78407	−1.199	2.308
Organizational Setup	3.9094	0.92167	−1.010	1.421
Marketing Support	3.9764	0.98578	−1.200	1.498
Flexibility	3.9291	0.93826	−1.131	1.637
Internal Communication	4.0000	0.89354	−1.307	2.589
Funding	3.7441	1.02222	−0.857	0.481
Legal Expertise	3.6811	1.10545	−0.793	0.197
Training Support	3.7835	0.92632	−0.939	1.346
Practices for TC process	3.7638	0.86848	−1.018	1.869
Management Support	3.7323	1.02111	−0.925	0.800
Sectoral Infrastructure	3.8497	0.68443	−1.130	3.291
IT Support	3.9449	0.88739	−1.055	1.739
R&D Support	4.0551	0.89183	−0.951	1.005
Entrepreneurship	3.9567	0.93784	−0.841	0.471
Geographical Location	3.9016	0.89914	−0.660	0.405
Size of firms	3.6614	0.90864	−0.552	0.373
Exim Policies	3.5787	0.87550	−0.599	0.839
Contextual Environment	4.0816	0.67904	−1.527	4.677
Culture	3.5669	0.88099	−0.607	0.441
Trust	4.0669	0.87986	−0.973	1.153
Understanding	4.1929	0.82344	−1.228	2.344
Communication	4.2559	0.82540	−1.315	2.494
Commitment	4.2520	0.81941	−1.234	2.280
Teamwork	4.2126	0.84001	−1.185	1.963
Training	4.0236	0.91940	−1.031	1.135
Technology Absorption Capabilities	3.8996	0.69606	−1.145	3.241
Appropriability	4.0157	0.79010	−0.755	1.281
Articulation	3.8976	0.82294	−0.966	1.834
Innovativeness	3.8071	0.87916	−0.879	1.336
Embeddedness	3.8386	0.86747	−0.926	1.403
Absorptiveness	3.8425	0.84278	−0.773	1.216
Intention	3.9961	0.85047	−1.042	1.981
TC Performance	3.6811	0.59211	−1.178	4.647

Overall, in terms of the six latent factors proposed, the descriptive analysis shows that contextual environment (M=4.08, SD=0.68) is most important while national policy support (M = 3.37, SD = 0.77) is least important.

Reliability Analysis

The reliability analysis was accomplished using Cronbach's alpha coefficient. A value greater than 0.7 for Cronbach's alpha indicates that the instrument is reliable in measuring the underlying construct. The

results are shown in Table 3, depicting acceptable reliability.

Correlation Analysis

Correlation analysis was done to analyze the relationship among the study variables. The correlation of input variables like National policy support, transferee characteristics, transferor characteristics, sectoral infrastructure, contextual environment, technology absorption capabilities, and output variable technology commercialization performance is given in Table 4.

As shown in the Table 4 the correlation coefficient 0.4.5–0.6.5 indicates moderate correlation and the correlation coefficient 0.6.5–0.8.5 is highly correlated. Additionally, National policy support correlates poorly with Transferor characteristics, Sectoral infrastructure, Contextual environment, Technology absorption capabilities, and TC performance. The next section analyzed the structural equation model for finding the relationship strength between the input variables (national policy support, transferee characteristics, transferor characteristics, sectoral infrastructure, contextual environment, technology absorption capabilities) and the outcome variable (technology commercialization performance).

SEM Analysis

The SEM model developed using SPSS AMOS 26.0 has demonstrated that practically the causal relationships as shown in Fig. 2 hold with the empirical validation done in the paper. The set of linear relationships between observed and unobserved or latent variables have been estimated using SEM Model.

The regression estimates are shown in the Table 5. Evidently, from Table 5, Contextual Environment is the most important latent factor impacting TC performance, with a regression estimate of 0.369. The least important factor impacting TC performance is National Policy Support, with a regression estimate of 0.004. Similar observations were drawn from descriptive analysis.

The goodness of fit indices viz. GFI, AGFI, NFI, and RMSEA are used to evaluate the model. In general, the

Table 3 — Reliability analysis using Cronbach's Alpha

Factors	No. of Items	Cronbach's Alpha
National Policy Support	4	0.828
Transferee Characteristics	19	0.918
Transferor Characteristics	10	0.939
Sectoral Infrastructure	6	0.854
Contextual Environment	7	0.902
Technology Absorption Capabilities	6	0.907
Technology Commercialization Performance	9	0.871

Table 5 — Regression estimates of factors on TC performance

Outcome variable	Predictor variable	Regression estimates
TC performance	National policy support	0.004
TC performance	Transferee characteristics	0.273
TC performance	Transferor characteristics	0.211
TC performance	Sectoral infrastructure	0.078
TC performance	Contextual environment	0.369
TC performance	Technology absorption capabilities	0.065

Table 4 — Pearson correlation analysis (N = 254)

	National policy support	Transferee characteri-stics	Transferor characteri-stics	Sectoral infrastructure	Contextual environment	Technology absorption capabilities
National Policy Support	1					
Transferee Characteristics	0.550** (0.000)	1				
Transferor Characteristics	0.294** (0.000)	0.585** (0.000)	1			
Sectoral Infrastructure	0.394** (0.000)	0.610** (0.000)	0.551** (0.000)	1		
Contextual Environment	0.345** (0.000)	0.553** (0.000)	0.534** (0.000)	0.729** (0.000)	1	
Technology Absorption Capabilities	0.407** (0.000)	0.583** (0.000)	0.547** (0.000)	0.641** (0.000)	0.749** (0.000)	1
TC Performance	0.376** (0.000)	0.698** (0.000)	0.568** (0.000)	0.599** (0.000)	0.642** (0.000)	0.603** (0.000)

** P < 0.01

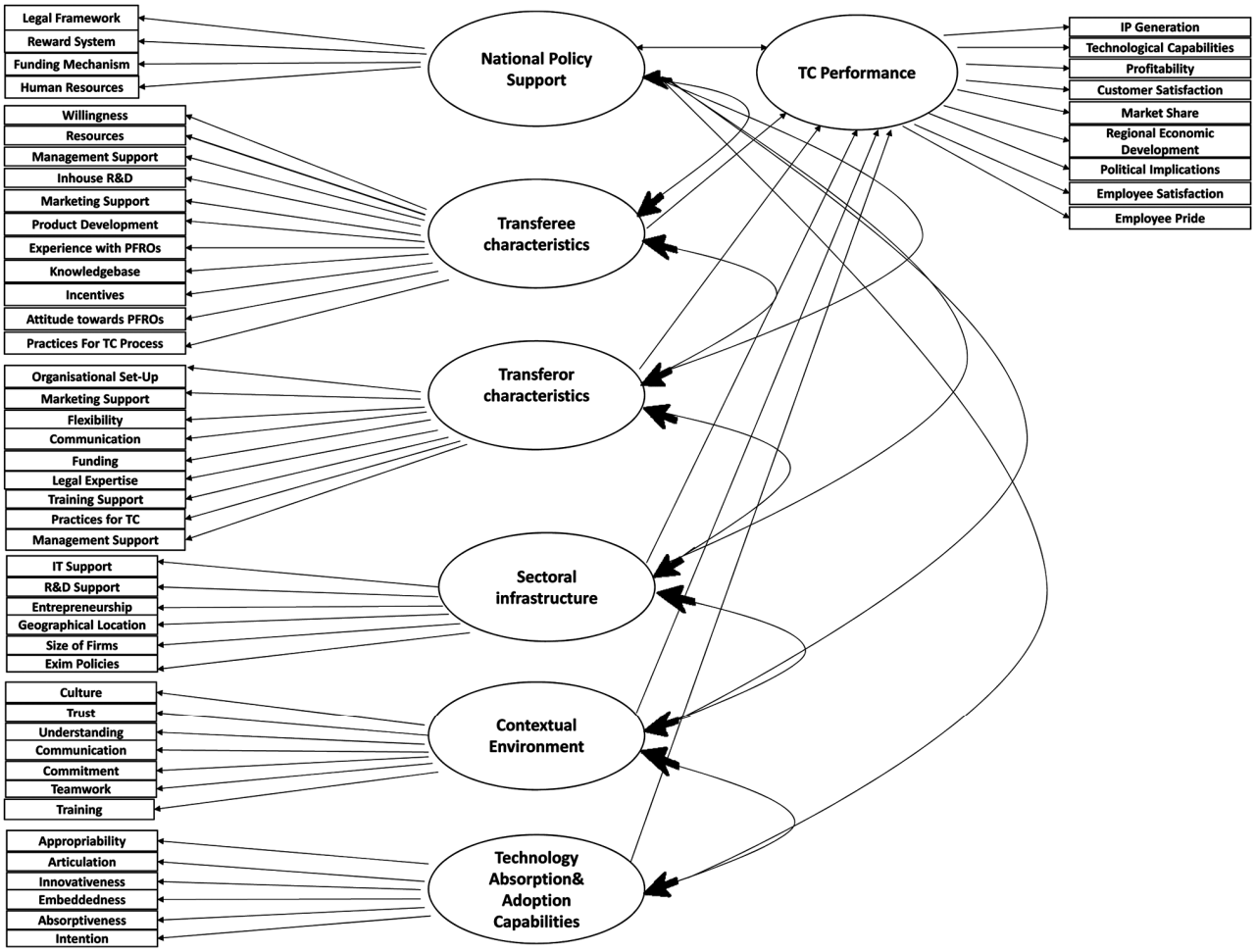

Fig. 2 — Structural Equation Model for Technology Commercialization performance

Table 6 — Fitness Indices for SEM

Indices	Suggested Value	Obtained Value
GFI	>0.9	0.966
AGFI	>0.9	0.963
NFI	>0.9	0.962
RMSEA	<0.08	0.043
$\chi 2$/df	<5.00	1.466

recommended level of acceptable fit for GFI, AGFI, and NFI, is 0.90 or above.[48] As for RMSEA, the recommended value should be less than 0.08.[(49)] The results of this analysis are presented in Table 6.

From Table 6, it is visible that the measured values are in confirmation of the recommended values. The model has a good fit and its relationships are meaningful and valid in the context of PFROs in a developing and emerging country.

Discussion

Technology commercialization from PFROs is a multi-faceted[50] and challenging process[9] having deep relevance for business and society[36] with significance for the entire value chain. Rybnicek & Konigsgruber identified success factors as institutional, relationship, output, and framework with the role of moderators (scale, level, phase, and sector) in the technology commercialization process.[11] Ankrah &Tabaa identified capacity & resources, legal issues & contractual mechanisms, management & organizational, technology, political, social, and other issues as contributors to the technology commercialization process with economic, institutional, and social benefits.[10] The current study has identified two additional latent factors – sectoral infrastructure and contextual environment, towards a holistic model suited for PFROs in a developing context. This has led to further using 43 observed elements that impact the performance of the technology commercialization process.

Earlier studies have not considered the modalities of technology absorption capabilities of the industry. In this context, theoretical contribution of the current study,

the proposed TCP-PFRO model, and its validation observe that the national policy support, transferee characteristics, transferor characteristics, and technology absorption capabilities positively affect the performance of the technology commercialization process. The sectoral infrastructure and contextual environment support technology commercialization as they help in the indigenisation of the technology.

National policy support is important, and the governments in developing countries like India are supporting fast-track translation and fast-track commercialization projects for technologies developed with sufficient technology readiness levels.[51] Kanojia *et al.* observe the weakness of policy support and propose policy changes for a more enabling ecosystem while suggesting to validate their model using SEM.[52] This study applied the use of SEM and the work confirms the weak impact of national policy support on the performance of technology commercialization. This seems to be indicative of static and dispersive support in the context of broad sectoral studies.

Tawate *et al.* proposed a sector-specific process-based model for technology commercialization using a case study design depicting the importance of infrastructure processes in successful commercialization.[53] The current work is a novel augmentation in this context by highlighting the relationship of sectoral infrastructure, contextual environment, and technology absorption capabilities and their positive impact on the performance of technology commercialization.

For a new product technology, the receiver has to make a huge investment in the demand creation for this marketing is required and decisions such as shelf life have to be taken. As the failure rate in such cases is about 95%[(54)], this work advocates that the transferee should have the willingness and prior experience of handling the technology.

Dong and Jong observed the social capital and absorptive capacity to be important for technology commercialization performance.[50] In contrast, the current study has comprehensively assessed the transferee characteristics in conjunction with technology absorption capabilities, contextual environment, and sectoral infrastructure. Bong *et al.* developed a framework using SEM to increase the effectiveness of the commercialization activity at the firm level, which has taken the technology from the PFROs.[15] The current study augments this work using the SEM model drawing implications for the PFROs towards the performance of technology commercialization.

Conclusions

ATCP-PFRO model has been proposed for the TC performance with six input factors and one outcome factor. The causal relationship of six input factors and the output factor using confirmatory factor analysis in SEM in the context of PFROs in a developing and emerging country has been empirically established. A good fit and valid model has been developed in the considered context. The analysis indicated the contextual environment to be the most important and national policy support to be the least important latent factor impacting TC performance. These findings can help the policymakers, industry, universities, and society have a better understanding of the role of PFROs in supporting the innovation capacity of the industries and technology commercialization performance. The study undertaken is for the Indian PFROs which offers insights for future research and more improvements for further analysis. Further empirical studies should aim at contextualizing based on the industrial clients of the PFRO. This would remove the problem of generalizations made in the study.

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