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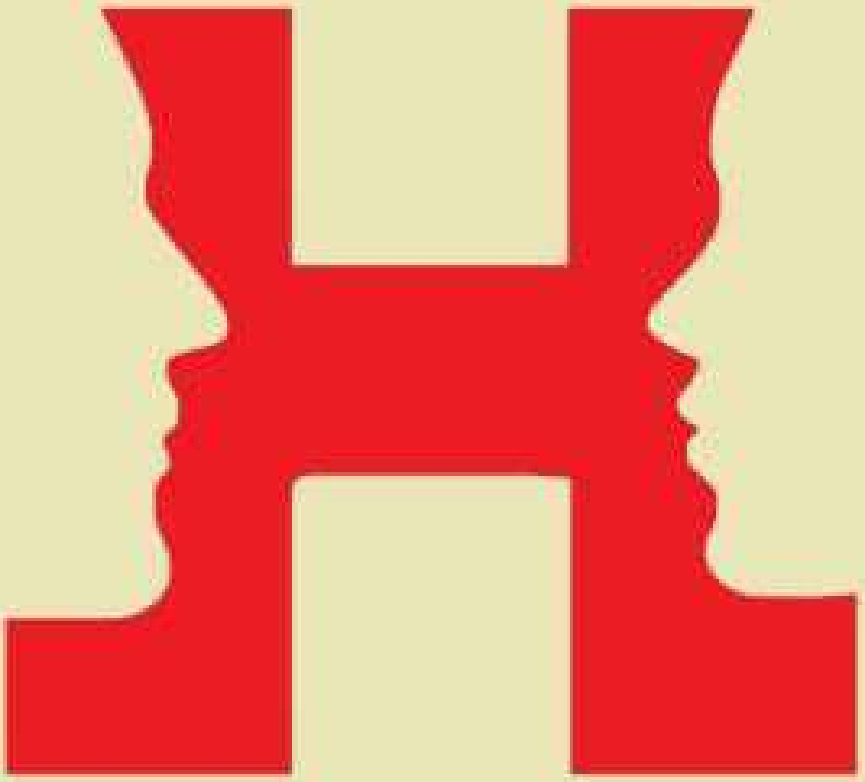

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IPR AWARENESS MODEL FOR ENGINEERING COLLEGE FACULTIES

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Abstract: In order to take forward the National IPR Policy and to boost creativity, innovation, competitiveness and economic growth in India, it is imperative to harness IP. Statistical program (Microsoft Excel and SPSS) was used to organize the data effectively. The data obtained was subjected to statistical parameters such as: mean median, mode, standard deviation, variance, etc. Tested research data for adequacy, normality, validity and reliability. Performed factor analysis and correlation analysis. Designing regression equation for estimating response variables as a function of set of independent variables. Here the main objective of the research is to identify the awareness factors for improving the awareness of IPR to faculties of engineering colleges affiliated to RTM Nagpur University. For achieving these objectives, all the above analysis were carried out. The instrument is developed for improving the awareness of engineering faculty members from affiliated colleges under the RTM Nagpur University. The instrument contains 25 Input and 17 output measurement items. The objective was to identify a relatively small number of factors that can be used to represent relationships among sets of many interrelated variables. The research study indicates that performance improvement model of IP awareness indicates six factors. Fundamentally focusing on these six factors will facilitate leverage for improving IP awareness performance and produce long term impact. These six factors and four performance measures incorporate the holistic approach of IP awareness in faculty of engineering colleges.

Introduction:

Intellectual Property Right Awareness

In order to take forward the National IPR Policy and to boost creativity, innovation, competitiveness and economic growth in India, it is imperative to harness IP. Inadequate knowledge about the rights of individuals to protect their ideas and innovations and poor awareness concerning the procedures involved in obtaining an IPR has hindered India's growth in Intellectual Property. Considering India's potential and its importance in the global arena, it's imperative to rise and become a leader in innovation and Intellectual Property.

Objectives

1. The identification of factors responsible for IP awareness will be reported.
2. Factors identified for awareness will help in improving profitability, productivity, quality and industrial growth by suggesting new means.

3. To formulate a generalized model for IPR awareness for engineering faculty of RTMNU, Nagpur.
4. Formulate customized IP awareness programs for specific needs of industries, MSMEs, start-ups, R&D institutions, science and technology institutes, universities and colleges, inventors and creators and entrepreneurs.

Review of Literature

The term Intellectual property is related to human brain applied for creativity and invention to betterment of existing technology. Various efforts in terms of input of manpower, time, energy, skill, money, etc., are considered to be important to invent or create something new. (Narayanan S. , 2010). Therefore, as per law, legal rights or monopoly rights are given to creator or innovator to harvest the economic benefits for their invention or creation. (Sharma, 2014)

IP creation is not only enhancing the science and technology system (universities, research organizations, firms' in-house R&D) but also for a region's organizational, institutional and policy-learning capabilities. (Gregersen,B &Johnson B, 2001). Lack of IPR awareness resulted in death of inventions, huge risk of infringement, economic loss and decline of an intellectual era in the country. (Samaddar, S.G & Chaudhary, B.D, 2008).

The Concept of critical success factors(CSF's) and performance measures is described by many researchers. (Motwani, 2001) The IPR awareness can be interpreted by a mathematical model incorporating input and output factors. (Black,S.A and Porter,L.J, 1996)

The critical awareness factors can be used to study the relationship with output or performance measures in terms of measurable quantity like number of IPR filed, satisfaction level, socio economic factors etc. (Daneil, 1961)

Research Methodology

Study used to find the behavioral study of the engineering college faculties with respect to IPR. The research method used was descriptive and experimental case study. Data collection had been done with survey method with the help of data collection tools viz. Questionnaires, Literature survey, discussions, Interviews, etc. A detailed Questionnaire was framed to study the awareness and use of IPR. Survey and Interview method was used to make the study more comprehensive.

Questionnaire for IPR Model Construction

Based on analyzing the responses obtained from faculty members of Engineering colleges under Nagpur University and my research study, a questionnaire for model validation was constructed with Six Input factors and four output factors thus derived. 25 input variables (attributes) were identified, while 17 output variables (attributes) were identified for the for model questionnaire.

The questionnaire consists of two parts:

Part I : Demographic data: contains preliminary information of respondents, details, and respondent perception on IPR awareness

Part II : There are number of factors involved in Awareness about IPR amongst faculty members. In this section respondents were requested to provide the feedback regarding the relative

importance of certain attributes in the IPR Awareness aspect among faculty members. Respondents rated items which, they felts most appropriate for each attribute on the basis of their perceptions about awareness.

Table 1: Five- point likert scale used in the questionnaire

1	2	3	4	5
Very low importance	Low importance	Medium importance	High importance	Very high importance
or Very poor	or Poor	or Fair	or Good	or Very good

The questionnaire was sent along with a covering letter (request letter) stating the objectives of the research study and promising confidentiality of data. The respondents were asked to return the questionnaire after filling it. Questionnaires are sent as Google forms (email), hard copies (hand delivery to some respondents). Reminders through personal visit, phone calls and emails were given to increase the rate of responses.

Statistical Analysis of Data

Statistical program (Microsoft Excel and SPSS) were used to organize the data effectively. The data obtained was subjected to statistical parameters such as: mean median, mode, standard deviation, variance, etc. Tested research data for adequacy, normality, validity and reliability.

Performed factor analysis and correlation analysis. Designing regression equation for estimating response variables as a function of set of independent variables.

Here the main objective of the research is to identify the awareness factors for improving the awareness of IPR to faculties of engineering colleges affiliated to RTM Nagpur University. For achieving these objectives, all the above analysis were carried out.

Data Analysis and Interpretation of Data

A large survey was carried out using questionnaire for 395 faculty members. Out of the 645 respondents from different faculties from various colleges, Faculty members (from varied disciplines) contributed to the survey by filling up the questionnaire and thus provided the desired information as shown in Table 2. The researcher employed different mode like Google forms, e-mail and direct collection method to collect the data from respondents as represented in Fig. 1.

Table 2: Response rate of the survey

Number of questionnaires distributed	Number of valid questionnaires received	Response Rate (%)
645	395	61.20

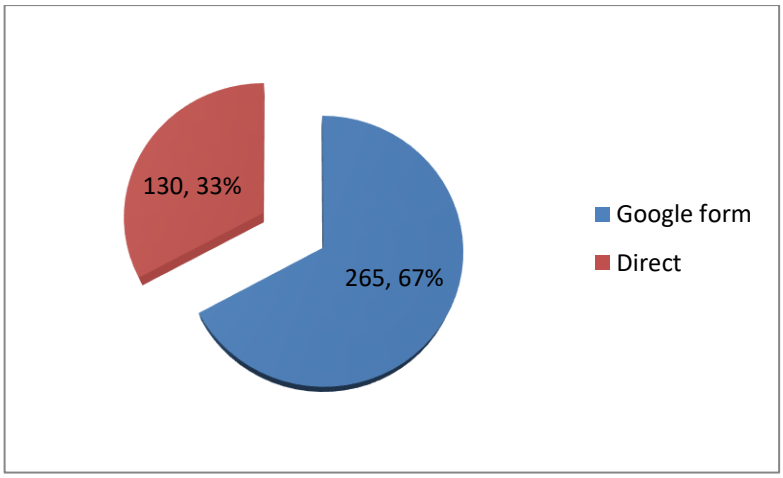

Figure 1: Response collection mode for IPR awareness model study

The respondents are classified according to the position and department wise category in Fig. 2 and 3 respectively. The data analysis revealed that the maximum respondents participated were Asst. Professors category (264, 67.8%) followed by associate professor (74, 19%), librarian (34, 8%) and professors (23, 6%) respectively. The strength of asst. professors was higher in all colleges and they are young and enthusiastic to participate in the said survey.

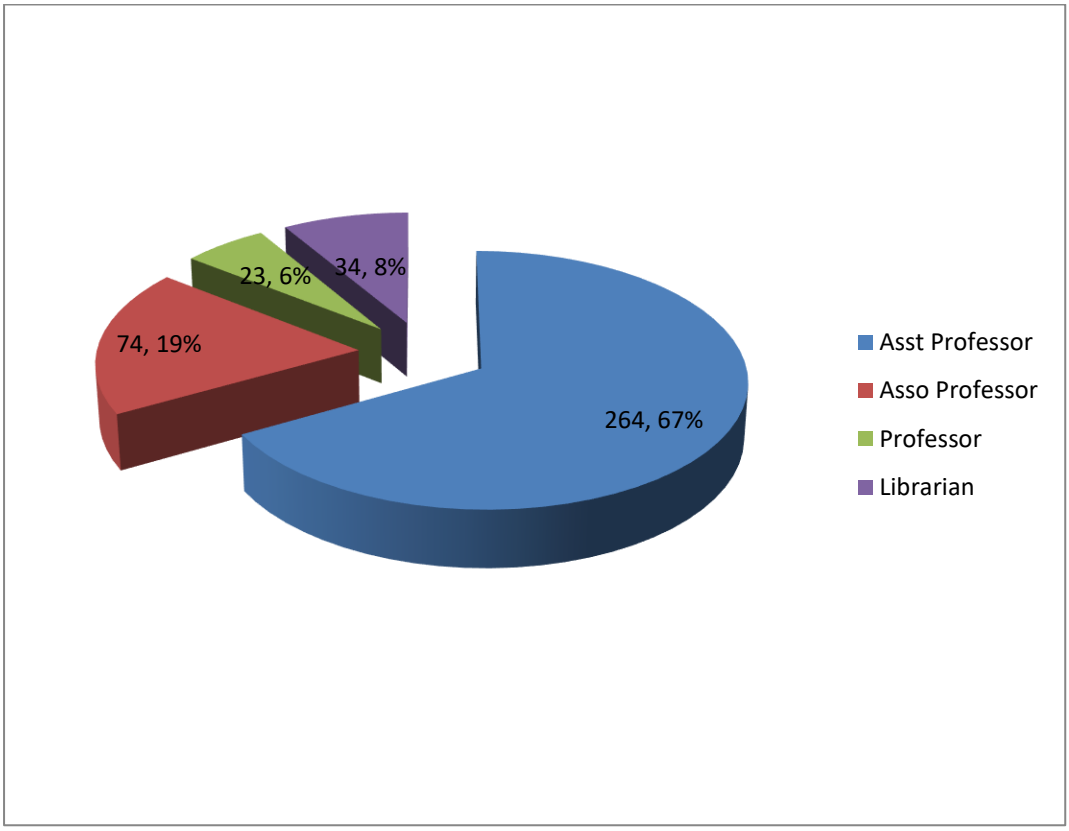

Figure 2: Department wise distribution of respondents

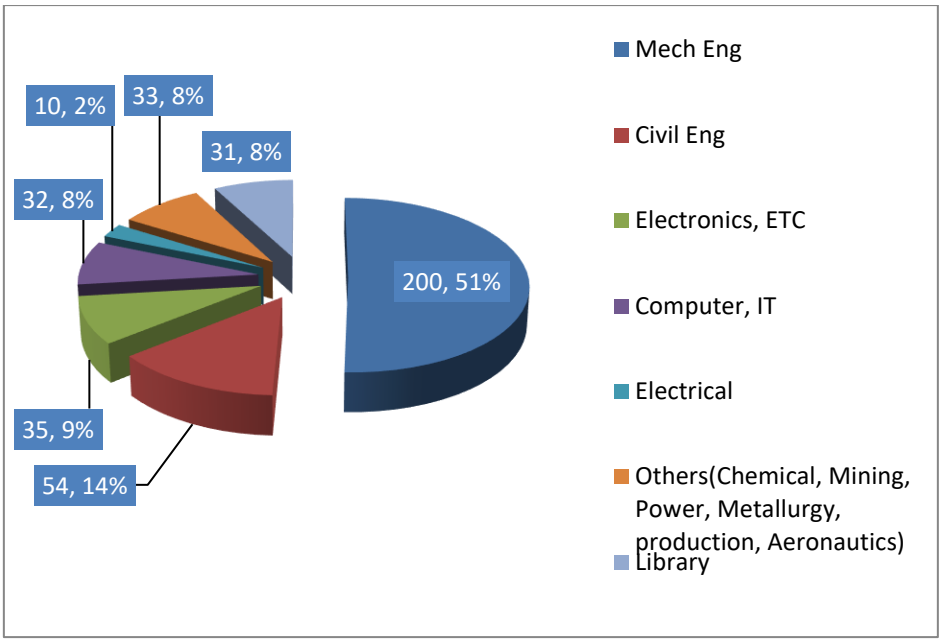

Figure 3: Department wise distribution of respondents

Similarly, the respondents are classified according to the department affiliation and found that the maximum respondents participated was found to be 200(51%) from Mechanical engineering followed by Civil engineering (54, 14%) and Electronics and ETC (35, 9%) respectively.

Normality

A lot of statistical tests (e.g., t-test) require that data are normally distributed and therefore we should always check if this assumption is satisfied. The normality test results for all input items and all output items found to be within the range.

Reliability of Data

While there is a lot of information to be gleaned from looking at correlations, what you really want is a single summary statistic that tells us how reliable our survey is. There are several ways to do this, the most common of which is Cronbach's alpha. Cronbachs alpha (1951) is a measure of reliability. The Cronbach's alpha value for all 25 input items are found 0.925 and for 17 output items this value is found to be 0.960 respectively(Table 3&4). The above values indicate that the questionnaire is reliable.

Table 3: Reliability of input data

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.925	.927	25

Table 4: Reliability of output data

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.960	.959	17

Factor Analysis

The instrument is developed for improving the awareness of engineering faculty members from affiliated colleges under the RTM Nagpur University. The instrument contains 25 Input and 17 output measurement items. The objective was to identify a relatively small number of factors that can be used to represent relationships among sets of many interrelated variables.

Factor analysis attempts to represent a set of observed variables *X1, X2…. Xn* in terms of a number of 'common 'factors plus a factor which is unique to each variable. The common factors (sometimes called latent).

Confirmatory Factor Analysis (CFA) technique is used in this research. In this Varimax rotation, an algorithm that minimizes the number of variables that have high loadings on the orthogonal factors is used to improve interpretability. Use of Confirmatory factor Analysis and Varimax rotation yielded 06 critical input factors and 4 output measure of performance improvements.

Interpretation and naming of Performance Improvement (Input) Factors

The Confirmatory factor analysis confirmed six critical input factors. The nomenclatures of the factors are done on the basis of items they which contain. Following six factors are considered as prominent factors for improving the awareness of Intellectual Property rights among faculty members of colleges affiliated to RTM Nagpur University.

- **Intellectual capital of faculties consists of**

  Human capital in creating IPR, Infrastructural capital, Innovation capital, Relational capital

- **R & D and commercialization mutually related to** Identification of project and research outcomes, IP Creation, Technology transfer, Benefit sharing

- **IP protection measures supported by** IPR Documentation, IP Management and training, Institutional support, Agreements and Licensing, Statutory/Legal Remedies

- **Prominent IPR Value chain Players are** Innovators, Academic Institutions-IPR cell, Consultants & ICT Providers, Governments Agencies Role

- **Funding or Sponsorship in IPR depends to** Viability of Project, Budgetary Issues, Availability of sponsors, Support of financial agencies

- **Institutional Motivation and Royalty in IPR is** Self motivated, Motivated by organization, Encouraged by Licensing and Royalty issues, Due to Career prospects.

Interpretation and Naming of Output Factors or indicators of performance

- **IP (CR,TM,GI,ID, TK Etc.) Creation is direct outcome by** Generation of Qualitative and Quantitative data, IP Management, Avoiding infringements on IPR, Avoiding duplication of research.
- **Development of Entrepreneurial abilities leads to** Business development, Benefit commercialization, Increased Licensing of projects, increased franchise arrangements, Development of new and better products.
- **Enhanced infrastructure and culture supported by** Trained staff for IP in Organization, Reputation and Brand image of institution, Enhanced culture in organization, Enhanced technological opportunity.
- **Outcome of Intellectual and financial gains by IP are** Incentives, Self esteem, Royalty income, Wealth creation.

Internal Consistency Analysis

- Internal consistency is one of the methods that can be used for assessing reliability (Nunnally, 1978). It indicates how well the different items of a scale measure the same concept and it is generally measured by means of a reliability coefficient such as Cronbach (α) coefficient alpha.

Table 5: Internal consistency analysis for Input Factors

Sr. No.	Name of Input Factors	No. of Items	Cronbach α
Bn	Intellectual capital of faculties consists of	4	0.780
2	R & D and commercialization mutually related to	4	0.779
3	IP protection measures supported by	5	0.703
4	Prominent IPR Value chain Players are	4	0.884
5	Funding or Sponsorship in IPR depends to	4	0.708
6	Institutional Motivation and Royalty in IPR is	4	0.702

Table 6: Internal Consistency analysis for Output Factors

Sr. No.	Name of Output Factors	No. of Items	Cronbach α
1	IP (CR, TM,GI,ID, TK Etc.) Creation is direct outcome by	4	0.806
2	Development of Entrepreneurial abilities leads to	5	0.741
3	Enhanced infrastructure and culture supported by	4	0.970
4	Outcome of Intellectual and financial gains by IP are	4	0.810

Detailed Item Analysis

- The Pearson correlation coefficient measures the linear association between two scale variables. The Pearson correlation coefficient works best when the variables are approximately normally distributed and have no outliers. A scatter plot can reveal these possible problems.
- Detailed item analysis is used to construct reliable measurement scales, to improve existing scales, and to evaluate the reliability of scales already in use. Specifically Item Analysis will aid in the design and evaluation of sum scales, that is, scales that are made up of multiple individual measurements. The method considers the correlation of each item with each scale. It helps to decide the proper position (group) of items.

Performance Improvement Factor (Input) and Relationship with Performance Measurement Factors (Output)

This section discussed the correlation between inputs (Performance Improvement) and output factors (Performance Measurement). Table 7 presents the correlations of input factor with all output factors. The detailed analysis of each input verses all output is shown below.

Table 7: Correlation between Input & Output factors

Correlations				
INPUT FACTORS	**IP Creation (CR,TM,GI,ID, TK Etc.)**	**Development of Entrepreneurial abilities**	**Enhanced infrastructure and culture**	**Outcome of Intellectual and financial gains by IP**
Intellectual capital of faculties	.816**	.731**	.715**	.677**
R & D and commercialization	.599**	.837**	.714**	.724**
IP protection measures	.561**	.500**	.506**	.588**
Prominent IPR Value chain Players	.965**	.673**	.608**	.565**
Funding or Sponsorship in IPR	.957**	.676**	.604**	.581**
Institutional Motivation and Royalty in IPR	.583**	.507**	.521**	.592**
**. Correlation is significant at the 0.01 level (2-tailed).				

Regression Analysis

Regression Analysis (RA) is a statistical method for determining the relationships among number of independent variables and dependent variable. RA also gives the information about how the dependent variable changes when anyone of the independent variables is varied, while the other independent variables are held fixed.

Multiple Regressions Analysis for Generalized Model

Multiple regression analysis for model is carries out with four dependent variables as performance measures and independent variables as six performance improvement critical factors.-

Y= Output= **IP Creation (CR, TM, GI, ID, TK Etc.)**
X1=Input_1= **Intellectual capital of faculties**
X2=Input_2= **R & D and commercialization**
X3=Input_3= **IP protection measures**
X4=Input_4= **Prominent IPR Value chain Players**
X5=Input_5= **Funding or Sponsorship in IPR**
X6=Input_6= **Institutional Motivation and Royalty in IPR**
The model can be written as: Y=a+bX1+cX2+dX3+eX4+fX5+gX6 and the

IP (CR,TM,GI,ID, TK Etc.) Creation factors = Y1 = 1.472 + 0.076 IP protection measures + 0.694 Prominent IPR Value chain Players + 0.238 Funding or Sponsorship in IPR

Development of Entrepreneurial abilities =Y2 = (-)1.373 + 0.139 Intellectual capital of faculties + 0.631 R & D and commercialization + 0.182 Prominent IPR Value chain Players

Enhanced infrastructure and culture =Y3 = (-)0.433 +0.393 Intellectual capital of faculties + 0.375 R & D and commercialization + 0.120 Institutional Motivation and Royalty in IPR

Outcome of Intellectual and Financial gains =Y4= (-)1.495 + 0.277 Intellectual capital of faculties + 0.406 R & D and commercialization + 0.236 IP protection measures

To determine the relative importance of the significant predictors, look at the standardized coefficients. Positive value of coefficients represents all variables contribute much to the model. Multiple regressions analysis is performed for all dependent variables of performance improvement factors.

Framework Model developed on the basis of relationship assessed between performance improvement factors (Input) and performance measures (Output) based on regression equations for generalized model.

Table 8: Regression Equations for Generalized Model for IP Awareness

Output Factors	Regression Equations	R^2 Value
(CR,TM,GI,ID, TK Etc.) Creation for IP Awareness	**Y1 =** 1.472 + 0.076 IP protection measures + 0.694 Prominent IPR Value chain Players + 0.238 Funding or Sponsorship in IPR	0.788
Development of Entrepreneurial abilities	**Y2 =** (-)1.373 + 0.139 Intellectual capital of faculties + 0.631 R & D and commercialization + 0.182 Prominent IPR Value chain Players	0.838
Enhanced infrastructure and culture	**Y3 = (-)**0.433 +0.393 Intellectual capital of faculties + 0.375 R & D and commercialization + 0.120 Institutional Motivation and Royalty in IPR	0.805
Outcome of Intellectual and Financial gains by IP	**Y4= (-)**1.495 + 0.277 Intellectual capital of faculties + 0.406 R & D and commercialization + 0.236 IP protection measures	0.800

Generalized IPR model in Fig. 4 shows that out of 24 relationships, 12 relations are weak and 12 are found to be strong. Model shows that there exists some relationship between each and every input and output factors, but the stepwise regression analysis given only strong (black arrows) and weak relations have been depicted with red arrows.

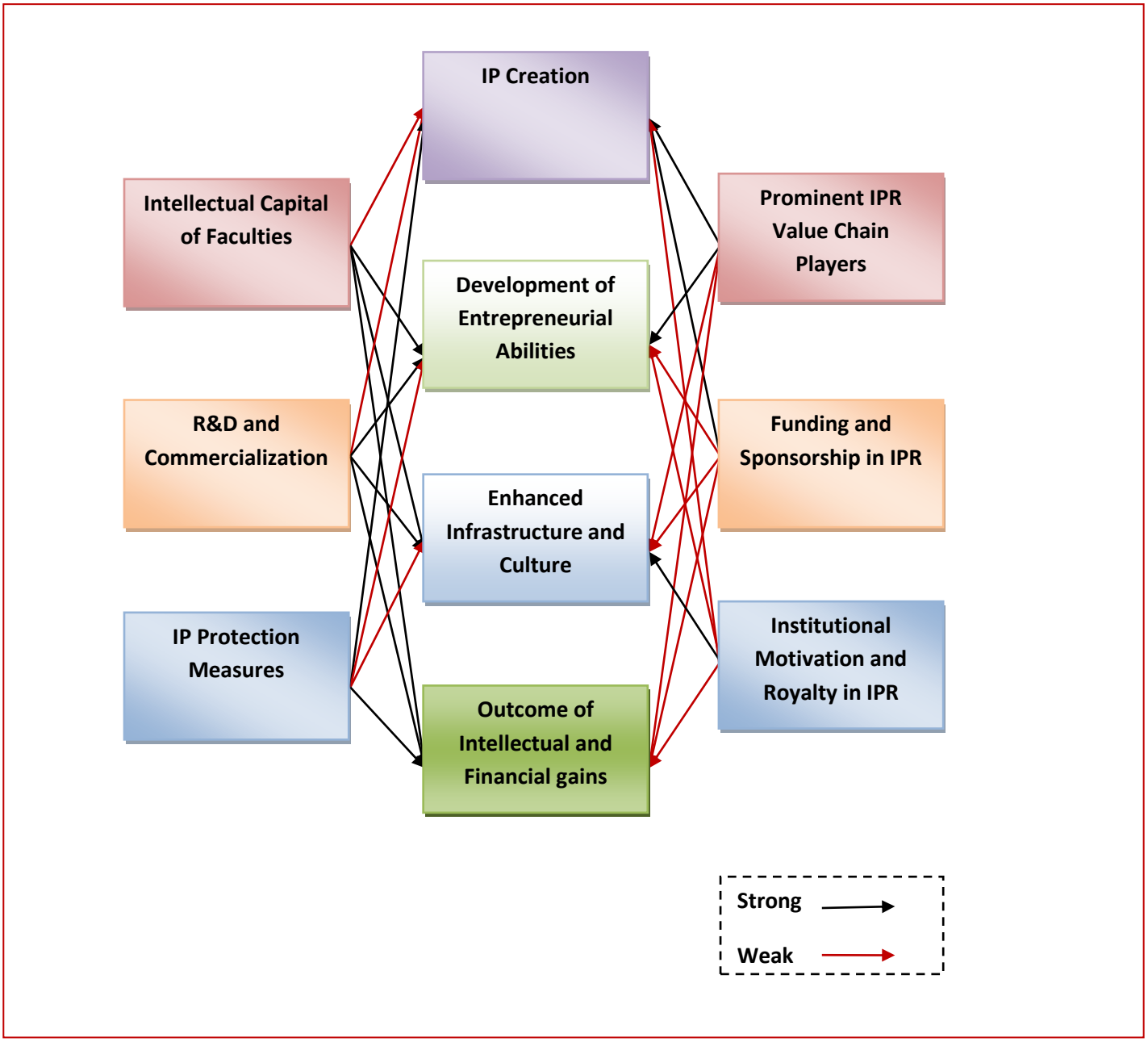

Figure 4: Generalized Framework (Model) for IP Awareness

Generalized IPR model in Fig. 4 shows that out of 24 relationships, 12 relations are weak and 12 are found to be strong. Model shows that there exists some relationship between each and every input and output factors, but the stepwise regression analysis given only strong (black arrows) and weak relations have been depicted with red arrows.

Conclusion

The performance measurement system developed in this research study can provide opportunities for the engineering fraternity to work collectively to develop the IP culture with a strategic vision towards

improving organization performance and establishing a collective value stream towards improving the Number of IP creations.

The research study indicates that performance improvement model of IP awareness indicates six factors. Fundamentally focusing on these six factors will facilitate leverage for improving IP awareness performance and produce long term impact. These six factors and four performance measures incorporate the holistic approach of IP awareness in faculty of engineering colleges.

- This study successfully prescribed a generalized model, for improving the IP awareness of the engineering faculty members.
- The novelty of this approach is that the set of awareness factors of performance improvement and performance measures of the IP awareness of engineering faculty members of RTM Nagpur Univ., Nagpur are derived on the basis of actual practices followed by engineering faculty based on a statistically validated instrument and factor analysis.
- All IP awareness factors of performance improvement derived in this study emerged as the strongest dimensions influencing all the four measures of IP sector performance.
- Integration of the awareness factors will lead to improved organization performance and thereby increased IP creation.
- IP awareness framework will improve the IP awareness & productivity of engineering faculty.

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