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Innovativeness of IT Employees and IP Creation

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ABSTRACT

Information technology is one of the major drivers of Indian economy. Hence the growth of this industry will also reflect in economic growth. Growth can be achieved only through innovativeness. The innovations of employees protected with intellectual property leads the organization to a leadership position. The factors that influence the creation of intellectual property in an organization are brought out in this paper. Through pair wise comparisons, the priorities of each of these factors are also derived.

Key words: I P Creation, I T Organizations, Resources, Practices, Motivation

1. INTRODUCTION

Intellectual Property (IP) is the basis for excellence and growth for organizations functioning in knowledge intensive industries like the IT industry. It is a means of organizational sustenance in highly competitive markets. When knowledge is the intangible product that provides the firm with its competitive advantage, that competitive advantage is vulnerable to imitation without some form of protection.(Budde-Sung, 2012). The most common techniques of protection used in the IT industry are patents and copyrights. In developing countries like India, technological innovation has a very significant role to play in economic growth.

Intellectual property is a topic that has been extensively talked about in the recent times. According to World Intellectual Property Organization (WIPO), Intellectual property (IP) refers to creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce.

Innovation is the key to the creation of Intellectual Property for an organization. Rogers (1998) in his paper on innovation says that innovative activity is not something that can occur separate from the firm's core activities; rather it must involve the coordination of various inventive, learning and implementation skills. Corporate innovation refers to the adoption of an internally generated or purchased device, system, policy, programs, process, product or service new to the adopting organization. A large number of studies have been conducted on

Intellectual property, majority of which deal with the legal side. It is also seen that the studies that deal with the creation and management of IP mostly focus on manufacturing companies. This study focuses on the factors that influence the creation of IP in organizations in the Information Technology Industry. The factors that influence the creation of an ideal environment that can best contribute to the creativity of the employees in an organization is brought out in this paper.

Information Technology companies have a higher value of Intellectual Property as compared to companies in other industries. The function of knowledge management is hence very important in IT companies. Its importance increases even more when considering the fact that the IT industry has a very high attrition rate in India.

Innovation orientation is a prerequisite for organizational innovation. (Laforet,2013). In professional services in particular, a culture of innovation is a crucial precursor to the type of innovative behaviors that can sustain organizations and foster organizational renewal. (Hogan, 2013). The Indian IT Industry has transformed from a reactive position, being an outsourcing option, to a proactive position in pursuing innovation; but still the number of patents owned by American firms with respect to the Indian IT industry is the highest, followed by Indian firms (Wang et al, 2012). Thus we can understand that there is still scope for harnessing the untapped potential, in the form of innovativeness of the employees.

Innovation is important, both at the organization and the employee level as it is a prerequisite for growth. A conceptual model that can be easily adopted to analyze and increase the existing level of innovation is thus required. Thus this study has been undertaken to create such a model and to bring out useful information that will help organizations understand their human resource better and provide scope for improvement.

Questionnaire survey of expert opinion has been used to gain insights into what the different factors influencing employee innovativeness are, and how an organization can prepare itself to achieve higher innovativeness. This understanding has then been integrated with current theoretical concepts from the literature, to generate a set of hypotheses. Using the data collected through questionnaire, an empirical test of the hypotheses was conducted. Analytical hierarchy process was then used to analyse the data collected (AHP),After discussing the results of AHP analysis and Chi square test, a conclusion has been presented at the end of the paper.

2. PREVIOUS LITERATURE

To come up with new processes and services, firms need to have access to detailed information on technological innovations of their competitors (Muellera et al, 2013). Besides basic competitive priority (quality, cost, delivery, and flexibility), innovation has been recognized as one of the primary sources of competitive advantage and sustainable economic growth (Bullinger, Auernhammer, and Gomeringer 2004).In addition to R&D spending and other innovation indicators of technology flows, patents and other intellectual property provide both financial and strategic values for a firm's core technology assets (kline, 2003). When slack resources are present, the criteria for acceptance of course of action are relaxed; increasing the probability that, decisions to spend slack resources on innovations will be approved (Fernandez and Pitts, 2011). The process by which an organization endeavours to

innovate its system is contingent upon its own circumstances and environment (Dooley and O'Sullivan, 2003). Measures of adaptive ability are different from measures of general intelligence and adaptive ability adds incrementally (relative to cognitive ability) to the prediction of job performance.(Elaine D. Pulakos et al, 2009).Firms obtain additional organizational resources in the form of IP rights so that their innovative activities are not affected and those firms operating in technology areas with higher concentration of IP ownership experience a lower probability of being confronted with problems(Muellera et al, 2013).Resources including financial resources, economies of scale, possibilities for risk spreading and greater capacity for specialization in people as well as equipment act as the relative strengths of large firms in terms of innovation (Laforet, 2013). To clients IT firms offer long-term solution responsibility and research. stimulate innovation.(Levén et al, 2014)Innovation management process is described as consisting of prospecting, ideation, constructing strategies, mobilizing resources, implementation and evaluation (Nagano and Stefanovitz, 2014).

When firms use creative capabilities and innovative characteristics as hiring and selection criteria, their employees are likely to spawn diversity of ideas and commit to more innovation behaviors (MAIER et al, 2014). Human Resource management function can influence and modify the attitudes capacities and behaviors of employees to achieve organizational goals and it plays a crucial role in nurturing the necessary conditions for catalyzing and channeling individuals towards the development of innovation activities (Chen and Huang, 2009). At HR level firms talk about innovations and support innovations, but they kill innovations offered by employees and managers (MAIER et al, 2014).Human capital resources have a cognitive dimension, such as vocational training and experience; and a demographic dimension, such as gender, age and cultural background, which affect the application and combination of existing knowledge and the communication and interaction between employees (Ostergaard et al, 2011).

Motivational models outline only the motivation to work as software engineers but they do not take into consideration the particular characteristics of a software engineer, or the contextual factors that affect them (Sharp et al, 2009).Reward system is a variable that takes effect on the individual level because that is where motivation originates (Buschgens et al, 2013). The Employee behavior will often be guided by the organization's reward system (Samnania and Singh, 2014). The reward system predicts how individuals are motivated, so when employees lack intrinsic motivation, the reward system should be designed to foster extrinsic autonomous motivation (Buschgens et al, 2013).Creating reward systems that recognize the value of human capital and which rewards performance excellence, requires a careful articulation among an organization's reward system, business strategy, organization design, information systems, and employees (Lawler, 2000).

Development of an innovation management process alone is not sufficient: innovation implementation system also requires the maintenance of organizational conducive context for innovation creation (Nagano and Stefanovitz,2014). In India predominant innovation practices appear to involve seeking complementary input- one where two different kinds of knowledge are combined for firm innovation by pursuing vertical inter-firm linking with others.(Franco et al, 2011).

The literature reviewed indicates that innovation, availability of slack resources, conducive environment, reward system, skill and knowledge level of employees, all play an important role in firm strategizing, to sustain business competitiveness by creating core technical assets. There are no studies conducted in the Indian IT industry attempting to bring out the relevance of these factors in intellectual property creation. Very few studies deal with IT companies, especially, on the need of innovation to meet out employee and organizational performance. This study attempts to fill this gap.

3. METHODOLOGY

Data Collection

Two groups of respondents were involved in the study, namely employees and experts. Data collection was completed in two phases. The first phase used a questionnaire survey for 112experts including University Professors and officials from Intellectual Property Center (Chennai, India).99 valid responses were collected, indicating a response rate of 88%.

In the second stage a group of 557 IT employees working in Chennai were administered with the second questionnaire out of which 502 valid responses were returned indicating a response rate of 90%. This group consisted of software engineers of different IT organizations located in the city of Chennai, India. The respondents indicated their degree of agreement or disagreement on a five point Likert scale.

Analysis Procedure

The study has identified four major factors that influences intellectual property creation through the process of data collection from experts. Thus four hypotheses were formulate to study the effect of these factors as follows

Hypothesis 1: Availability of organizational resources does not influence Intellectual property creation.

Hypothesis 2: Interpersonal communication in an organization does not influences Intellectual Property creation.

Hypothesis 3: Motivation and personal development does not influences Intellectual property creation.

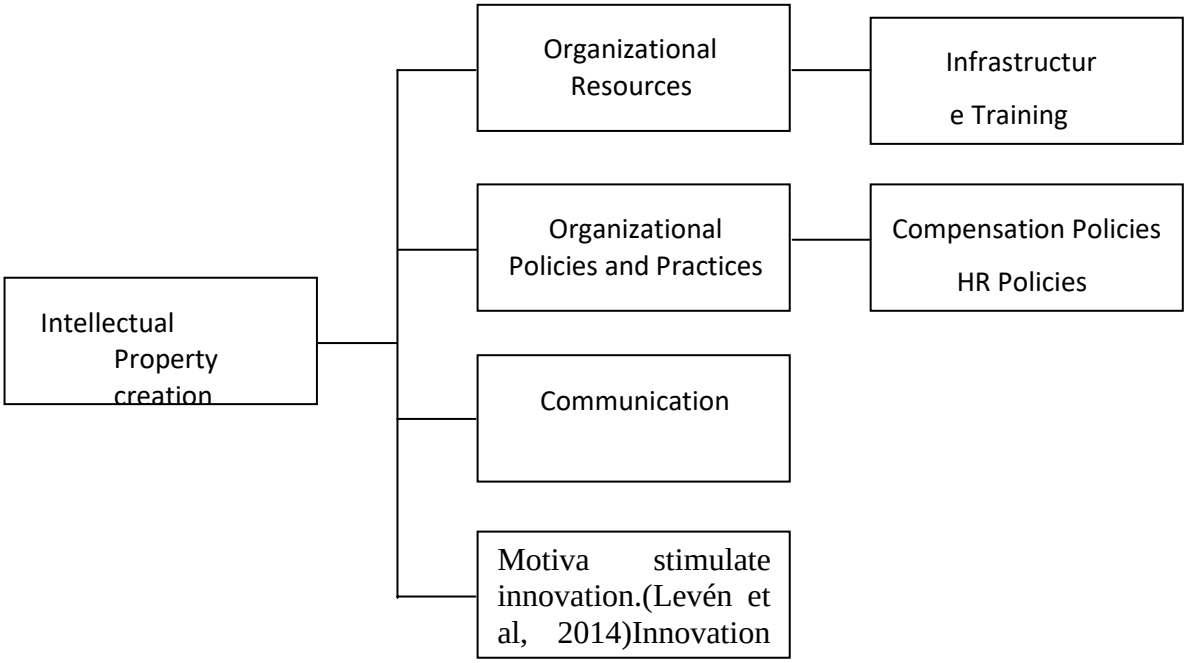
Hypothesis 4: The innovation policies and practices of an organization will not influence Intellectual Property creation.

The study uses Analytical hierarchy Process (AHP) technique which is a mathematical system to derive at decisions. In this paper the technique has been used to identify the factors that influence the creation of Intellectual property in an organization and their relative importance. Using AHP, the pair wise comparisons of the various factors and sub factors are performed to assign weights which indicate the relative importance of each of the factors.

The first half of the study was done to identify the factors that affect intellectual property creation in an organization. The data obtained in this phase was qualitative in nature. Hence the technique of Analytic hierarchy process was used for its analysis.

The factors that influence Intellectual property creation, and the influence of each of these factors are brought out in this paper. A conceptual model has been developed here to study the

factors influencing IP creation in an organization. Four major factors were identified which influence Intellectual Property creation, namely organizational resources, organization policies and practices, communication and motivation. The conceptual model is represented in Figure 1 showing the factors and sub factors.



Analytic hierarchy process uses the pair wise comparison of the four factors and the 12 sub factors. Table 2 to table 5 shows the comparisons of the factors and sub factors. The weights and consistency indices for each of these comparison matrices are then computed. AHP analysis uses a special scale for recording the responses. It uses a nine point scale to compare two factors, ranging from extreme preference for one factor to extreme preference for the other with equal preference as the midpoint of the scale.

The consistency index (CI) is calculated as per equation (1) below.

$CI = (\lambda max - n)/n$ (1)

The consistency ratio is finally computed using equation (2) as shown below. $CR = (CI/RI)$ (2)

The random index (RI) for the calculation of consistency ratio has been taken from the random consistency index given by Thomas L Saaty (Saaty,1980). Saaty's random index table is as given in Table 1, where 'n' stands for the dimension of the pair wise comparison matrix.

Table 1 Random Consistency Index

N	1	2	3	4	5	6	7
RI	0	0	0.58	0.9	1.12	1.24	1.32

When CR $\leq$ 0.1 the results are said to be acceptable. Thus CR represents the credibility of the data.

The second phase of the study was targeted to understand the employee perspective on actual conditions in the various organizations to which the respondents belonged. This phase has helped to bring out the attitude of respondents towards IP creation.

4. RESULTS AND DISCUSSION

According to the Chi square test it is observed that all the four hypothesis can be rejected at a p value less than .01.Thus we have strong evidence to infer that

- Organizational resources influence Intellectual Property creation.
- Communication influences Intellectual Property Creation.
- Motivation and Personal development influences Intellectual Property Creation
- Innovation policies and practices influence Intellectual Property Creation.

Factors Affecting Intellectual Property

Tables 2 through 6 show the pair wise comparisons, which is the most important part of AHP, of the factors identified in the study. It can be seen that all the CI and CR values are less than or approximately
0.1 in the pair wise comparison matrices below indicating that the results are credible.

Table 2 Factors Affecting IP creation

	Resources	Org policies and practices	Communication	Motivation and Personality Development	Weights
Organizational Resources	1.0000	2.0451	0.7252	2.5279	0.3220
Communication	1.3789	1.7337	1.0000	2.3857	0.3581
Motivation and Personality Development	0.3956	1.2851	0.4192	1.0000	0.1592

CI=0.0193 CR=0.0214

The pair wise comparison of the factors in Table 2 show that in an IT organization the most important role in influencing the creation of intellectual property is played by 'communication', closely followed by Organization Resources. Organization Policies and Practices and finally Motivation and Personality Development have the third and the fourth places respectively.

Organization Resources

From the relative weightages given to the three sub factors of Organizational Resources in Table 3, it is evident that the importance of Infrastructure is slightly greater than Training and development and much greater than Knowledge management in the organization. Even the physical environment influences innovativeness of employees, hence organizations should make sure that they provide the employees with all the necessary infrastructural facilities. An efficient system for collecting and storing the knowledge and information of the employees is

required, so that the absence of an employee does not affect the knowledge base of the organization. The availability of training and development can also increase employee innovation level as seen in the model.

Table 3 Organizational Resources

	Infrastructure	Training and development	Knowledge management	Relative weights
Infrastructure	1.0000	1.0052	1.8042	0.1255
Training and development	0.9949	1.0000	1.6926	0.1248
Knowledge management	0.5543	0.5908	1.0000	0.0716

CI= 0.0003CR=0.0005

Organizational Policies and Practices

From the relative weightages shown in Table 4 it is evident that the order of importance of the three sub factors of Organizational resources are as follows, Compensation Policies> Innovation Practices> HR policies. Thus a change in compensation policies may take the organization a long way in terms of enhancing innovativeness.

Table 4 Organizational policies and practices

	Compensation Policies	HR policies	Innovation Practices	Relative Weights
Compensation Policies	1.0000	2.0206	1.0799	0.0673
HR policies	0.4949	1.0000	0.7026	0.0365
Innovation Practices	0.9260	1.4233	1.0000	0.0569

Communication

Table 5 shows the pair wise comparison for Communication and their relative weightages. We observe that the highest priority has been given to upward communication followed by downward communication and horizontal communication. Employees expect their ideas to be accepted and appreciated while communicating in the upward direction. But it is likely that they fear that their ideas will be duplicated or misused.

Table 5 Communication

	Upward	Downward	Horizontal	Relative weights
Upward	1.0000	1.0656	1.2077	0.1840
Downward	0.9385	1.0000	1.1615	0.1741
sHorizontal	0.8280	0.8610	1.0000	0.1511

CI=3.3E-05CR=5.7E-05

Motivation and Personality Development

The relative weightages of the sub factors of Motivation and Personality Development are shown in Table
6. Promotions have the highest priority followed by Awards and Personality Development respectively. It is thus inferred that on streamlining the motivation policies, employee innovativeness can be enhanced. On understanding that innovation can take them to higher levels in the management hierarchy, employees will try to innovate in their day to day activities.

It was observed that 48% of the employees innovate in order to achieve recognition in their work environment. Recognition is therefore a major motivating factor for innovation. The employees like the job they do as confirmed by 83% of the employees. This fact in itself can act as a motivator for innovation.

81% of the employees feel that innovation can help them beat peer competition. This means that a majority of the employees will implement new ideas and processes in order to reach ahead of their competitors, but at the same time 70% of the respondents state that they do not apply their innovative ideas for fear of failure.

Table 6 Motivation and Personality Development

	Personality Development	Awards	Promotions	Relative weights
Personality Development	1.0000	0.6670	0.6980	0.0390
Awards	1.4992	1.0000	0.3320	0.0400
Promotions	1.4329	3.0120	1.0000	0.0800

CI= 0.0746CR= 0.1286

Out of the total respondents, 69% agreed to have good vertical communication in their organizations. This may be because of the employees' perception that innovative ideas have a better chance of implementation on communicating with superiors. A subordinate should be able to freely communicate with his superiors about his novel ideas and the superiors should

be willing to discuss these with an open mind. Only 27% of the respondents have good horizontal communication.

68% of the people agree that they want their organizations to organize more training programs to help them innovate. Lack of knowledge can be a serious impediment to innovation which can be overcome by conducting training sessions for the employees on latest technologies. Only 22% of respondents agree that their organization provides them with the necessary slack resources for innovation. Slack resources may include time and other software or hardware resources necessary for innovation.

According to the employee responses, the motives for innovation are ordered as follows; recognition, promotion, monetary Benefits and Efficiency respectively.

5. CONCLUSION

The success of any organization lies in understanding the requirement of the market and exceeding their expectations by providing them with technology that is unimaginable to them. This concept has its basis in innovation. It is a known fact that any organization that does not grow every day cannot sustain very long. The overall growth of the organization is a result of a motivated work force.

The process of communication is very important at all levels. Providing the right resources can foster innovativeness but, a healthy relationship among the employees is important to foster the innovativeness. Interpersonal communication, which includes communicating with superiors and subordinates, has the highest influence on the innovativeness of an employee.

Employees have a fear of failure due to which they are not implementing their innovative ideas. The organization should suitably motivate their employees and instill confidence in them for risk taking. Organizations should ensure that their human resources are given training in the latest technologies in their field.

The relative importance of each of the factors and sub factors of IP creation are clearly outlined so that the implementation of the model is possible. Thus this study has been undertaken to create a model for IP creation which will help organizations to compare and assess their present situation and to prepare strategies to improve it. Organizations can use the model to locate areas demanding change and formulate strategies and action plans for IP management. This model acts as a platform on which new researches may be based.

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