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Investigating Impact of Computational Intelligence on Agile HR Practices

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ABSTRACT

HR has increasingly gained prominence as a business partner over the last few years. Alignment of HR strategy with business strategy and the increasing effect of HR practices and policies on business results has help won HR the recognition of business partner. Adoption of data driven approach and using HR analytics to analyze metrics has helped in generating meaningful insights. This emerging trend has opened up enormous opportunities for usage of computational intelligence and AI tools in HR Analytics. This paper aims to investigate the impact of computational intelligence on agile HR practices, which help in providing valuable real time insights impacting business performance. Though computational intelligence is being widely applied in several other fields of science and management, it has found very few applications in HRM so far. Therefore while investigating the present applications of computational intelligence in HR practices, the authors also propose an intelligent model for agile team deployment using artificial neural networks, highlighting the scope of application of computational intelligence in this area of HRM as well. The model relates team effectiveness and orientation to competencies related to technical expertise, people skills and innovative thinking, and then employs machine learning to arrive at best team composition.

Keywords: *Artificial Neural Networks, Computational Intelligence, Human Resource Management, Real Time HR Analytics, Team Deployment*

I. INTRODUCTION

The traditional view of HR being an administrative support is being replaced by an increasing appreciation of the fact that HR is a strategic and business oriented function [1]. This emergence of strategic HRM includes aligning of HR processes with business goals within the organization [2].

Traditional HR practices included collection and track of employees' personal and professional information, such as payroll, health benefits and performance reviews. In present scenario the functionality of HR has extended its edges and is trying to analyze data to play a more active role in the organization. HR has proven its potential to become a strategic partner by using metrics to its advantage [3].

HR Analytics is a data-driven approach. HR analytics add value to their organization by focusing on HR policies and practices which impact performance of organization [4]. HR data analytics is being embedded into all kinds of HR systems which include recruiting, engagement, performance management, succession

management and learning. People Analytics, a subset of HR analytics, helps organizations to improve decisions related to people for the purpose of advancing success at both the levels of individual and organization. People Analytics can be very successful in recruiting and hiring talented individuals, motivating and rewarding employees, and developing and retaining the best. In real sense People analytics is nothing but the application of statistics and modeling to the data related to worker which enables to predict patterns. Similarly, talent analytics helps in generating insights right from recruitment to workforce planning. The workforce planning issues include requirement of the staffing for a particular region or labor costs and productivity.

With the emergence of human resources analytics, the companies are able to predict fraud and detect compliance violations, identify top employees at risk of quitting and find the drivers of unplanned absences among staff. In present scenario, to figure out what makes people join, perform well in, and stay with an organization; who will likely be successful; who will make the best leaders; and what is required to deliver the highest-quality customer service and innovation, there is a need of data repositories and data analytics. Without predictive analytics models, it has now become difficult for HR department to harness people data.

Thus we see that HR Analytics has been instrumental in improving various HR policies and practices of organizations by providing meaningful insights. This has positively impacted organizational performance and thus established HR as a business partners over the last few decades.

II. COMPUTATIONAL ALGORITHMS AND HR ANALYTICS

The growing importance and potential of HR analytics cannot be understated. However, figuring out what metrics to collect, separating correlation from causality, and arguing for or implementing changes based on people data requires an extremely high level of data science expertise [5].

Over the years, many statistical models have been developed in the field of HR Analytics using existing software technologies and IT tools. These models have relied on robust computational algorithms to predict patterns and outputs.

For example, in Predictive Attrition model, an organization can predict employee attrition under stable circumstances. The algorithm in this model enables an organization to gain better understanding and helps to take preventive measures for employee attrition. The model utilizes clustering method which classifies employee profiles based on various demographic variables such as age, gender, marital status, education level, work experience, distance from hometown, etc. and generates various levels of risk of attrition. Intermittently, other parameters like performance over the years, pay raise, work batch, educational institution are also taken into deliberation.

Classification model lists the employees based on their risk to leave the company. Non-Linear Regression model gives the output in terms of the probability of attrition when the outcomes are dichotomous. Decision Trees model estimates the loss based on factors like gini index, information gain and variation reduction. The decision trees tend to become very large and complex in case of models involving multiple parameters. In the case of models which involve multiple parameters, Random Forest method combines several decision trees using multiple algorithms to classify and understand complexities and predictions.

These models aim to provide good predictability. However, seamless implementation depends on choosing the right model. The utility of these models is based on the parameters, availability of budget, computational power and decision maker's requirements.

Some of the reasons for success of modern data analysis techniques are availability of more data for analysis, advancement in computation power, advent of new methods and algorithms, and new analysis process.

Thus we see that the field of HR Analytics has been immensely benefitted from the advancements in the field of software technologies, computational algorithms, and improved processing capabilities of machines.

III. APPLICATIONS OF COMPUTATIONAL INTELLIGENCE TECHNIQUES IN THE FIELD OF ANALYTICS

Computational intelligence refers to the ability of a computer to learn a specific task from data or experimental observation. It is a set of nature-inspired computational methodologies and approaches to address complex real-world problems to which mathematical or traditional modeling can be useless for a few reasons: the processes might be too complex for mathematical reasoning, it might contain some uncertainties during the process, or the process might simply be stochastic in nature[6]. Indeed, many real-life problems cannot be translated into binary language for computers to process it. Computational Intelligence therefore provides solutions for such problems. Some of the computational intelligence techniques being used today are shown in Fig. 1

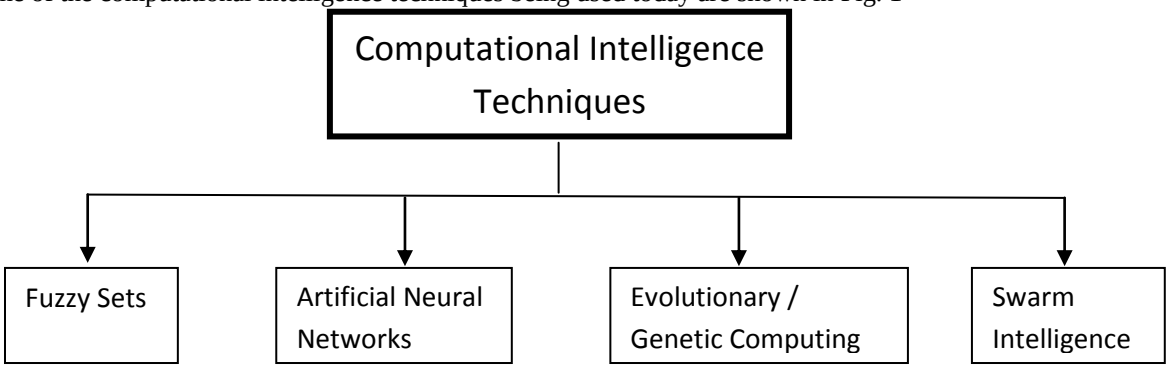

Figure 1: Computational Intelligence Techniques

Computational intelligence techniquesare widely applied in varied disciplines like biology, finance, economics, image processing, information reasoning, operations etc. to generate valuable insights. Application of techniques such as artificial neural networks (ANN), fuzzy systems and evolutionary computation has dramatically increased in many disciplines of biomedicine and biochemistry and is expected to grow in near future [7].

In Financial Economics, Games and Industrial organization, Macroeconomics, Econometrics, Preference, Risk, and Uncertainty, different applications of the computational intelligence techniques have shown a new perspective for approaching problems [8]. Financial engineering has seen applications in issues related totrading strategy generation, financial forecasting, portfolio management, asset pricing to name a few.Computational Intelligence (CI) models include robust computing methodologies with a high level of machine learning quotient to handle problems that come across in the field of image processing and information reasoning as well [9].

IV. PRESENT APPLICATIONS OF COMPUTATIONAL INTELLIGENCE IN HR

Though real time analytics has gained prominence in every area of management, HR has been slower as compared to its counterparts in embracing it. However, today several frameworks have been suggested to understand employee patterns by analyzing organization from the inside, by mining e-mail, Skype, and calendar data; and from the outside, by crunching Twitter, Wikipedia, and blog data [10]. Data-driven tools also help in showing real-time correlations between coaching and engagement, employee motivation and other vital trends.

In recent years, machine learning and artificial intelligence has taken a great leap forward. Real time data analytics is further made effective by right use of AI tools. Many organizations like Citigroup, Goldman Sachs, and UBS Group use AI software to assess traits like teamwork, etc. AI tools help in predicting which employees will succeed at a given job, which employees are best suited for a particular role, etc. These AI tools, by analyzing resumes, documents, video interviews and other methods help generate key employee patterns [11].

As shown in Fig.2, ability (cognitive and intellectual) of Self-learning AI has surpassed the cognitive and intellectual ability of human limit and Former-AI [12].

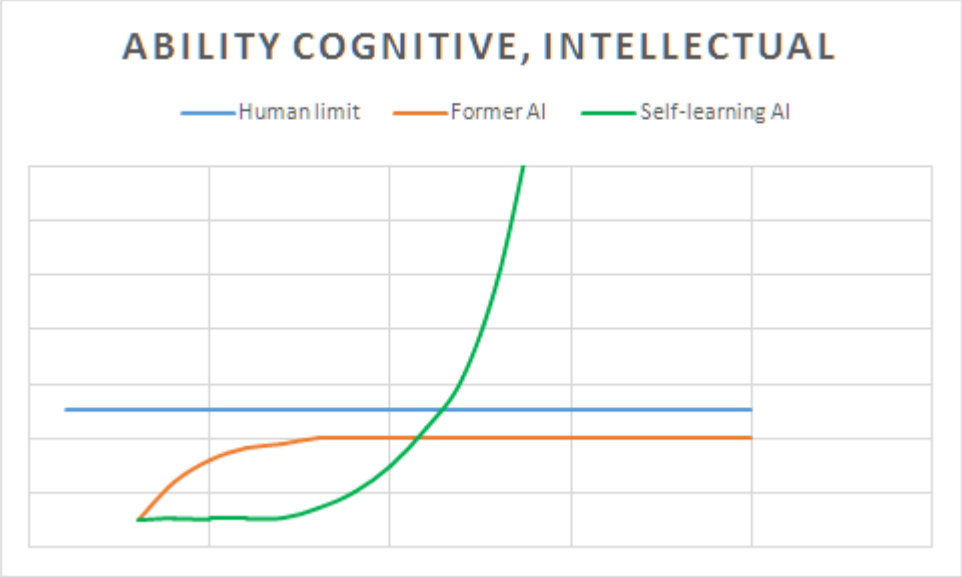

Figure 2: Ability of Self Learning AI

Thus we see that these tools, by employing self-learning AI, enable us to create models that go far beyond our human limits in understanding patterns related to employee behaviors and other HR aspects.

A new generation of 'pulse' survey tools and open anonymous feedback systems can allow employees to rate managers, executives, and just about everything else at work on a near-real-time basis. The thoughtful use of such tools can create a true 'listening environment' for employees while giving leaders critical insight into what's working and what's not working in the company [13].

Some of the present applications of computational intelligence in HR have been shown in Fig. 3 below.

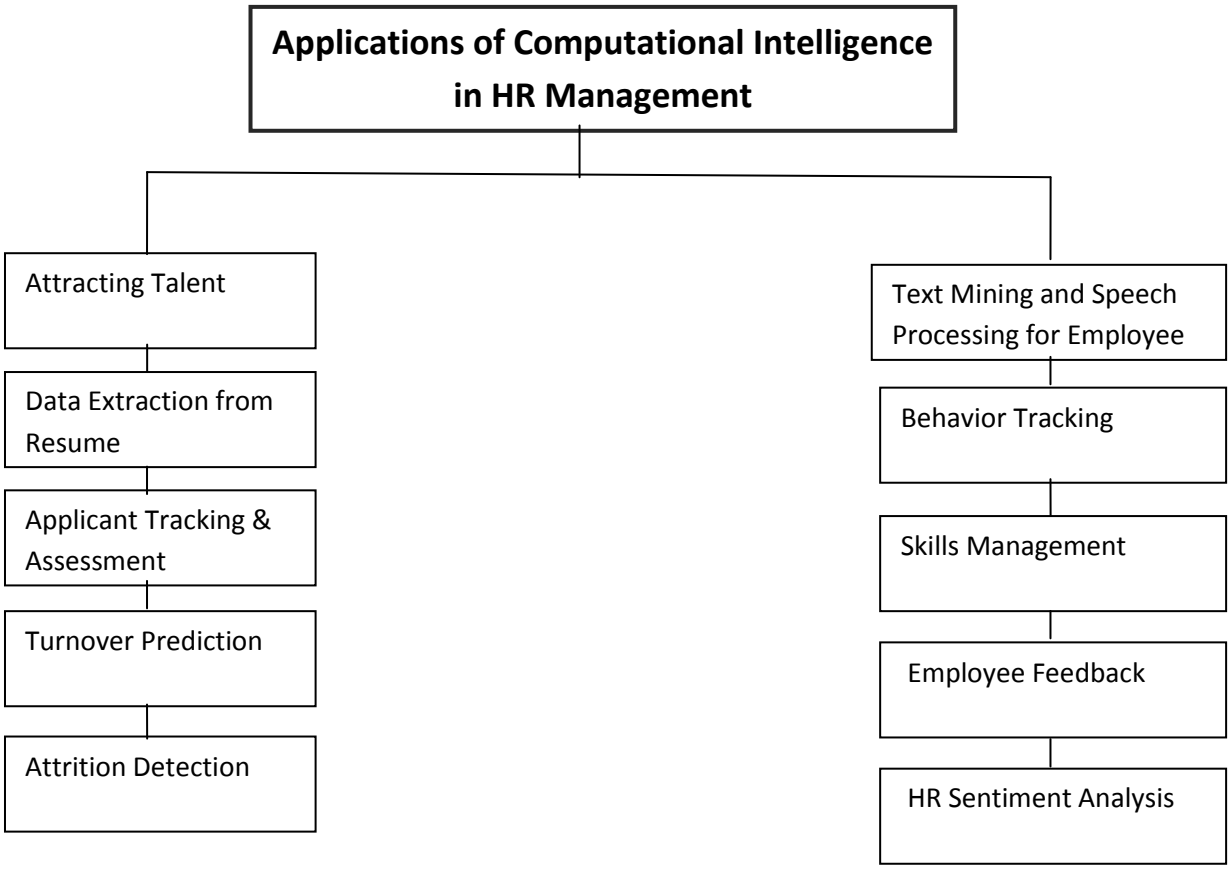

Figure 3: Present applications of computational intelligence in HR

V. APPLICATION OF COMPUTATIONAL INTELLIGENCE IN TEAM DEPLOYMENT: A PROPOSED MODEL USING ARTIFICIAL NEURAL NETWORK (ANN)

Apart from the present scope of application of computational intelligence techniques in HR analytics as discussed in previous section, there is a significant scope of use of these techniques in building and deploying agile teams.

Today's complex business scenarios, with need for rapid and flexible response to change, require solutions through the collaborative efforts of agile teams.

External environments and specific project requirements determine the effectiveness of the team deployed. Team Effectiveness for a particular project can be derived as a function of following three orientations - the amount of technical expertise required, people skills required and the ability of the team to come up with innovative products and solutions. These three orientations required for a team are detailed in Table 1, with a list of competencies affecting the orientations.

Table 1: Competencies Affecting Team Orientations

Expertise Orientation Competencies	People Orientation Competencies	Innovation Orientation Competencies
Technical Knowledge	Emotional Intelligence	Agreeableness
IQ	Political Skills	Critical Thinking
Programming Skills	Cross Cultural Competencies	Diversity
Data Analysis Skills	Communication Skills	Conflict
…….	…….	…….

A different type of team is needed in each situation to be effective. A range of team effectiveness score can therefore be obtained for any particular project, indicating a team's suitability, as a function of the above mentioned three orientations (as plotted in Fig. 4).

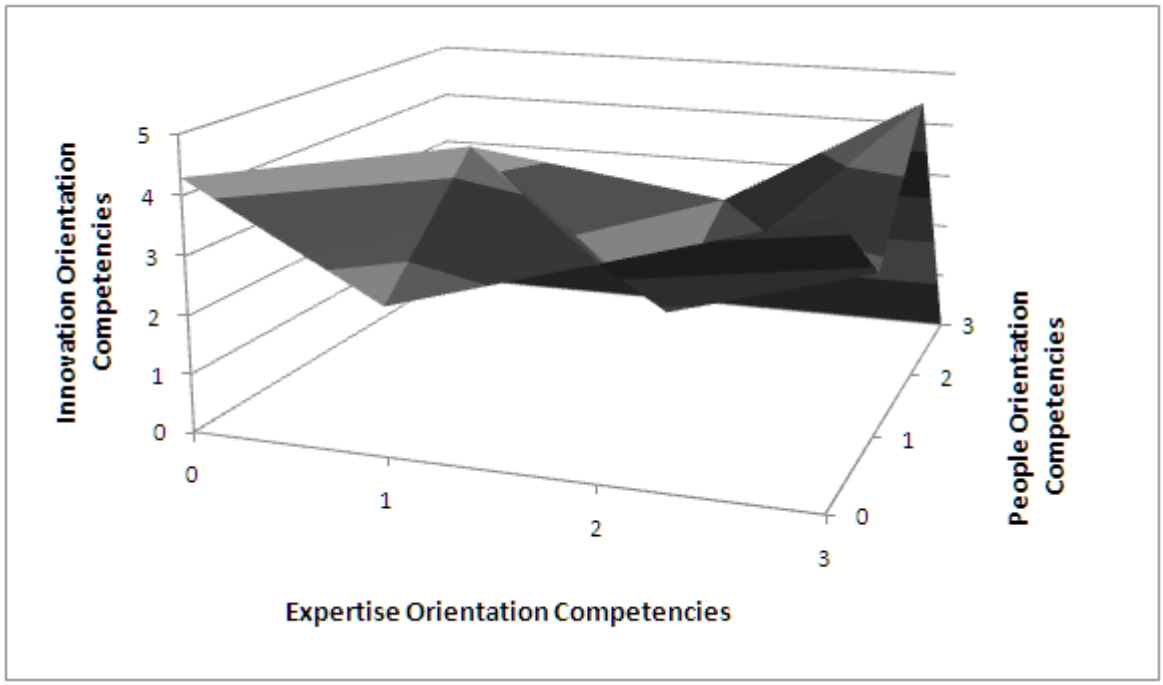

Figure 4: Team Effectiveness Range as determined from Project Requirements

Further, the relationship between team effectiveness, orientations of the team and the competencies affecting these orientations can be expressed in the form of following equations (1 and 2):

$$\boldsymbol{Team\ Effectiveness\ (TE)} = \pm\alpha + \sum W_i \times O_i \qquad \text{-(1)}$$

where,

W_i = *Weightage of* i^{th} *Orientation*

O_i = i^{th} *Orientation*

i = 1, 2 and 3

$$\boldsymbol{Orientation\ (O_i)} = \pm\beta + \sum\sum W_{ij} \times C_{ij} \qquad \text{-(2)}$$

where,

C_{ij} = j^{th} competency corresponding to i^{th} orientation

W_{ij} = Weightage for j^{th} competency corresponding to i^{th} orientation

i=1, 2 and 3

j=1, 2, 3, 4, …., n

These equations need to be experimented and validated empirically. With the help of computational intelligence, a model can be prepared with feedback mechanisms and machine learning algorithms to work out the team effectiveness. Prototype of such a model is given in Fig. 5 below.

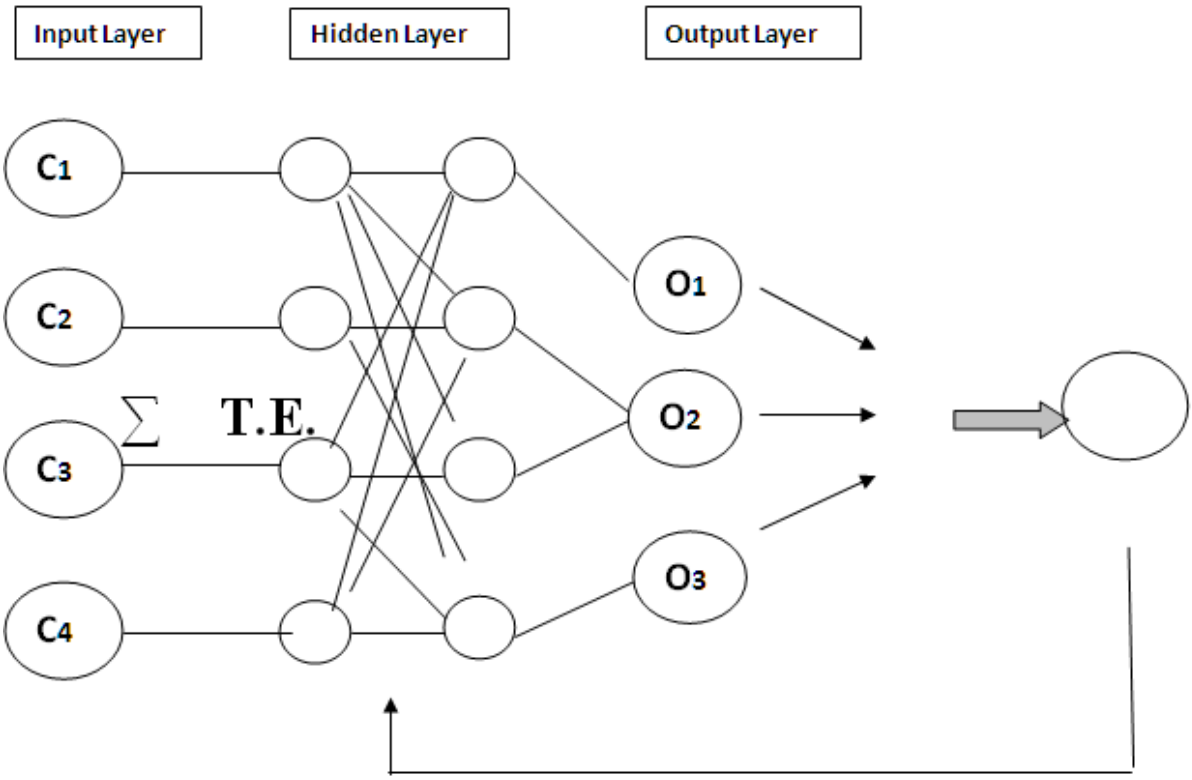

Figure 5: Depictive ANN (Artificial Neural Network) for Team Effectiveness

The above model helps us in ascertaining competencies required in the team (C_t), as determined with the help of team orientation and team effectiveness, which in turn are defined by project requirements.

These competencies of team (Ct) can then be mapped with individual competencies of team members (Ci) ('t' is a subset of 'i'). This concept helps us in developing another model based on machine learning (ANN) to help select team members from available manpower pool, with the help of a Matching Index (MI), which indicates the degree of suitability of a team member's competencies for the desired team. A prototype of such a model is given in Fig. 6 below.

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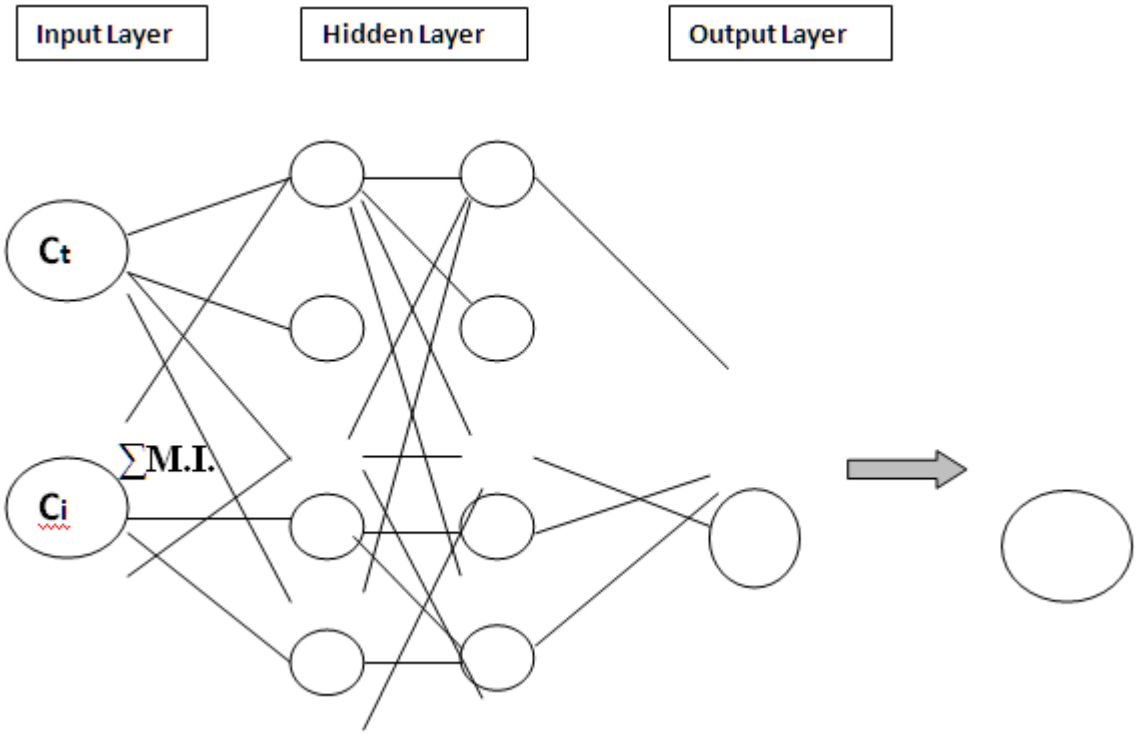

Figure 6: Depictive ANN (Artificial Neural Network) for team member selection

Based on the Matching Index obtained, best possible combination of the team members can then be selected for the desired team as shown in Fig. 7.

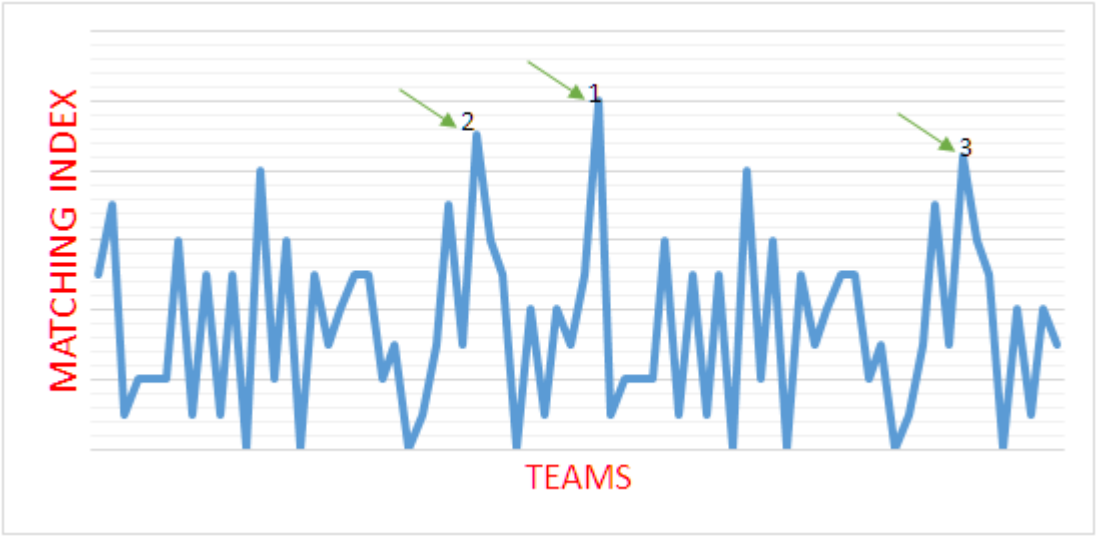

Figure 7: Team members' selection for the desired team with the help of proposed model

The proposed model can also be explained with the help of a block diagram as shown in Fig. 8

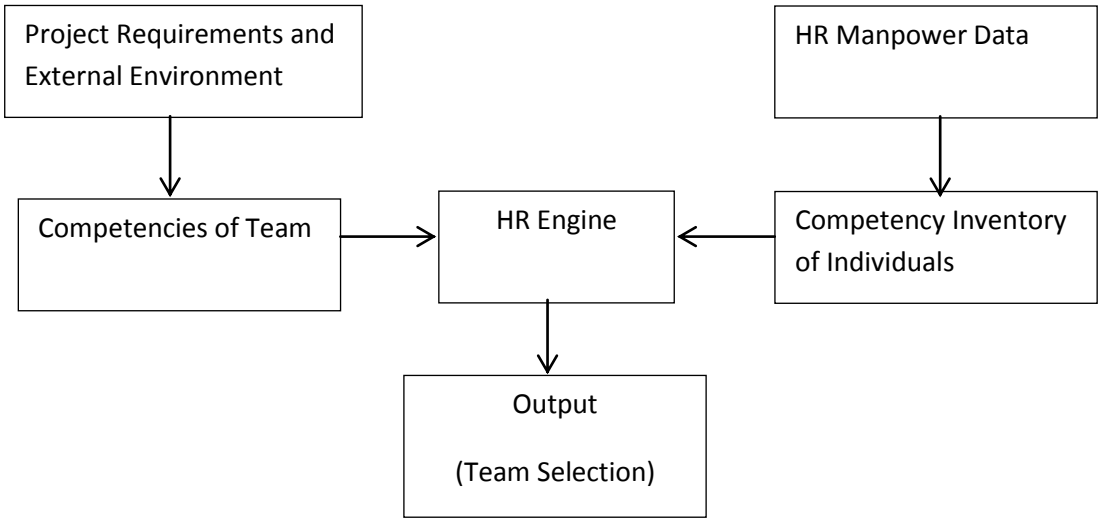

Figure 8: Block Diagram of the proposed model for team selection and deployment

VI. CONCLUSION

After a comprehensive review of literature and study of best practices adopted by organizations globally, as detailed in previous sections of this paper, it can be concluded that HR analytics has played a vital role in emergence of HR as a business partner. HR Analytics has helped management arrive at sound and prudent business decisions with the help of meaningful insights. Thus it is apparent that HR Analytics needs to further evolve to meet demands of today's complex business environments and provide insights on a real time basis. Therefore the use of computational intelligence in enhancing the effectiveness of HR Analytics is going to emerge as a major thrust area. The paper investigated and highlighted the impact of computational intelligence on HR analytics, and thereby agile HR practices. The paper also suggested a model for deployment of agile teams using computational intelligence. The model relates team effectiveness and orientation with competencies related to technical expertise, people skills and innovative thinking and then employs machine learning to arrive at best team composition. This model also indicates an enormous opportunity for application of computational intelligence in the field of HRM, where it has found fewer applications so far as compared to other fields of management and science.

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