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Complexity Enhancing Dubiousnesses: Empirical Evidences from Chinese PM Firms

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Abstract- This paper has been drafted to explore the major project management challenges faced by the project management organizations and other industry in China. These challenges push organizations to complexity. This research also highlights managerial skills required to cope with these challenges and to reduce the project complexities. A lion share of literature has pointed out long lists of critical success factors for project management, but still projects are getting more complex and success is not deemed to intuitive assumptions.

Results show that stakeholders' conflict, ambiguous strategic priorities, inadequate effort estimations, cultural misalignment, business politics, lack of trust, ignorance of key risks, poor communication, unrealistic timescale adjustments and frequent requirement changes are the major factors which lead projects towards complex supposals. A variety of responses have changed the weightage of the above said factors. Nevertheless, all factors have been accorded to be considered seriously so that projects may be avoided from complex scenarios. Conversely, conflict management, anxiety control, leadership, enthusiastic approach, public relations, planning and scheduling, grasping technical knowledge, future prediction techniques to assess the future risks are basic characteristics necessary for project managers to get rid of unexpected and complex situations. The research also has highlighted the fact that alignment among complexity factors and managerial competencies is the best tool to manage the complexities in project management.

Keywords- *Project Complexity; Project management; Chinese PM Professionals*

I. INTRODUCTION

Project is a sequence of tasks. These tasks are undertaken for a fixed period of time to meet the specific and unique tasks and goals [1][2]. 19th century has been considered as the major paradigm of managing the projects especially managing the project cost within predefined timelines. Initiating, planning, executing, controlling, and closing are the processes for project management [3]. Fayol [4] defined these processes in terms of project management functions with the sequence as plan, organize, command, coordinate, and control. In certain cases, ambiguities are in mind about routine tasks and projects but these are entirely different. Production of a specific item in an industry is a task but development of new product line or its design is a project. Projects are helpful for organizations to achieve strategic goals and objectives. To meet the project specified goals, project managers need to draw specific lines and use project management tools to keep project on track. Considering the importance of project management, many organizations have turned their directions to adopt new project management tools and techniques [5, 6]. Rapid developments and discoveries have expanded the technology but shortened the life span of innovations. These challenges have made firms and organizations risk-prone. Mega projects with strategic and defense objectives, construction projects, IT projects [7][8] [9] [10] and oil and petrochemical projects have become more complex due to their volume and ignorance of unforecasting factors.

Literature on project management has used the terms, like project complexity, project uncertainty, project risks and project complications depending upon the requirement of the term used. That's why definition of uncertainty and complexity also varies from researcher to researcher. Hostager's perception about complexity is that how people perform under complex conditions [11]. Williams [12] relates complexity with the underlying structure of project. Baccarini narrates complexity in terms of differentiation and interdependency [13]. Taking into account previous insights however, simplicity and complexity can co-exist and co-evolve [14]. Complexity is a measure of degree of unpredictable information and the actor's ignorance about reality. In point of fact, two meanings of complexity do exist as; Algorithmic (Procedural) Complexity refers to complication and Natural (Contextual) complexity refers to complexity itself [14].

A system is complicated especially when it is unpredictable as stated by Janice and Thomas [15] and unpredictability is the state where system is intricate or hard to understand. A complex system is composed of many interconnected parts. It is emerging from the hard sciences and focusing on highly adaptive and self-organizing systems. Mostly authors use 'complexity' to describe a specific part of the order/chaos spectrum, but legendary work of [16] reverse these definitions and talk about the science of complexity as the whole and 'chaos' as a part in the middle where the future emerges in a neither predictable nor random way. Forecasting

techniques for managing complexity has been ascribed by Pall as structural-based and behavioral oriented [17].

Complex systems contain many relatively independent parts which are highly interconnected and interactive. A system might be *Complex*; as a result of non-linear interactions among systems elements with unpredictable consequences. Or *complicated;* as a result of decomposition, as they are not characterized by unpredictable non-linear interaction.

Project Complexity is defined in terms of differentiation and interdependency, managed by integration [13]. Risk and uncertainty have triggered the organizations to evaluate and decide during project execution [18] rather than deciding all the things at the starting phase as in traditional project management views. Reason is the emergence of market future with the passage of time [19] as risks and uncertainties are the management hazards which cannot be at the time of conceptualization.

Complex projects can be determined with typical characteristics as interconnection and interdependencies of ingredients [13], including uncertainty: uncertainty in goal and methods [12], lack of transparency among partners for common outcomes [20] improper communication among participants [21], projects uniqueness [22] and dynamism of elements [23], so much to take in, and so little time to decide [16-19]. Dynamics in nature and responsive to minute changes [24]. Complex projects (Complex systems) are not just complex adaptive systems but rather complex evolving systems [24].

Taking into account previous insights, the objective of this paper is to investigate various complexity factors. These factors have been listed down on the basis of views of experts and practitioners.

These constituents have been agreed to be considered seriously to avoid complex conditions. Managers equipped with managerial and leadership traits can tackle such complexity enhancing dubiousnesses. A leader always focuses on problem solving rather than on seeking first to understand the problem [15]. It is same as suggested by [25] that managers are in constant interaction, exchanging information, learning, and adapting their behavior in locally coherent ways. *Specificity* is the key for leadership as specific aspects of leadership in a specific domain appear to influence specific aspects of performance in a specific context over a specific time [26]. Public relation is a prominent trait in the managerial traits spectrum. Project managers' social structure has strong influence to access to valuable resources [27, 28] that helps to overcome social complexities.

Major issue for this research is to target those project managers/consultants managing projects. Due to their busy schedules and scattered sites, it was not convenient to catch them in a single attempt. Professionals' telecon helped to design questionnaire but research survey was conducted by face to face meetings and sending emails. Alignment among the Project uncertainties and competency spectrum required to cope with these uncertainties leads towards smooth execution of construction projects in Chinese culture. This research can be proved as a guiding step for construction industry to consider these challenges seriously and pay more attentions on alignment with competency spectrum to avoid the project failures in future.

II. RESEARCH DESIGN/APPROACH

This effort will pave the way for project management professionals to overcome project complexities. Project managers from various domains and grasping experience of successful projects in China have been targeted to know their views about the complexity enhancing factors and managerial competencies required to cope with these complexities. An empirical research has been performed to examine the perception of the Project Managers and experts doing projects in the various orbits of sciences. These experts have been serving as project managers or consultant in the different geographies of China for long period of time. Research instrument was designed on the bases of complexity enhancing dubiousnesses and managerial competency spectrum required to cope with these uncertainties. The questionnaire has been designed on the basis of initial interviews of the project managers and researchers in China. Initial part explored the demographic information of the respondents. Second part was to explore the opinions of experts about the constructs of hypothesis. Detailed survey of responses has been analysed using SPSS software.

This empirical research has been conducted based on Hypothetico-Deductive method where both qualitative and quantitative research methods are used. Project managers doing project of diverse nature were asked about the major challenges faced during managing the projects. In the next section of interview, they were inquired about their managerial skills used to tackle the encountering complex challenges for managing projects. Their responses were converted into the list of factors and a research instrument has been established. This instrument had two parts. Initial part dealt with the demographic information of the respondents. Later part has main constructs and items to be evaluated by the Project managers on the basis of their experiences. Response was scaled on 5-liketr scale.

Initial interviews were major problems as it takes long time and effort to explore project managers with project management expertise and experiences. Many issues were there to conduct this research as project managers are normally very busy with their hectic schedules and meetings. Second reason was to select project managers from various project domains and nature. Some researchers at research institutes, managing construction and electronics projects were also involved to enhance the research sample. Due to above mentioned reasons, author has used snow-ball data sampling techniques where respondents are selected based on their specialties and core competencies.

A. *Data Characteristics:*

Research questionnaires were sent to respondents using both online and face to face techniques.32 online and 61 face to face questionnaires were requested. 13 online and 33 face to face responses were received. Only 49.5% responses were received. Language barrier is also a major problem for initial interviews and face to face survey as well. We had also to filter respondents only who can speak English especially for initial interviews. Responses with 20% missing values have been rejected for this research. 4 respondents didn't provide complete information and their questionnaire were considered to be dropped. At the end, only 42 responses were included to conduct this research. Respondents were selected from various project management firms and institutes. Project managers from various domains as; organizations providing consultancy for construction projects, mega project from oil, gas and petroleum industry, research institutes doing projects on materials and machines, electronics projects and projects related with Information technology and telecom sector. Participation from each sector has been depicted in figure 1.

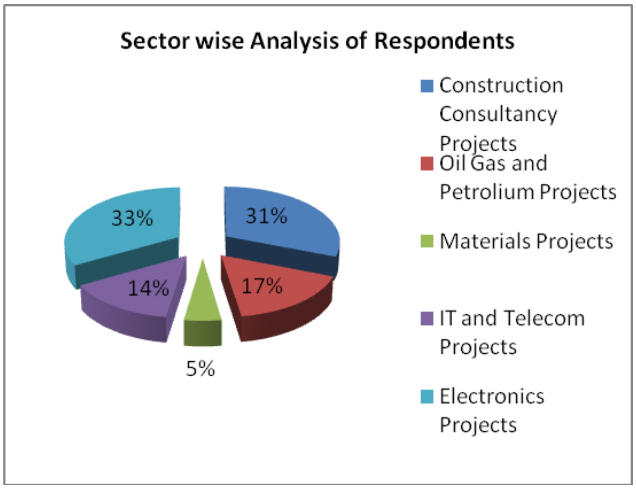

Fig-1: Sector wise Analysis of Respondents

III. RESULTS AND ANALYSIS:

Data has been collected through three main variables and 23 items. Statistical analysis software has been used to validate the data. Hypotheses have been conducted on the basis of the factors mentioned in the previous section. Data collected for this research is considered as reliable as Cronbach's Alpha value is justifying the significant level of reliability for 23 items.

Table 1: Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	***N of Items***
0.837	23

Null hypothesis assumed that all the data is normally ditributed. Normality of data ditribution in each variable has been checked. Results indicated that there is no difference of distribution of data. Histogram for data distribution is shown in figure 2.

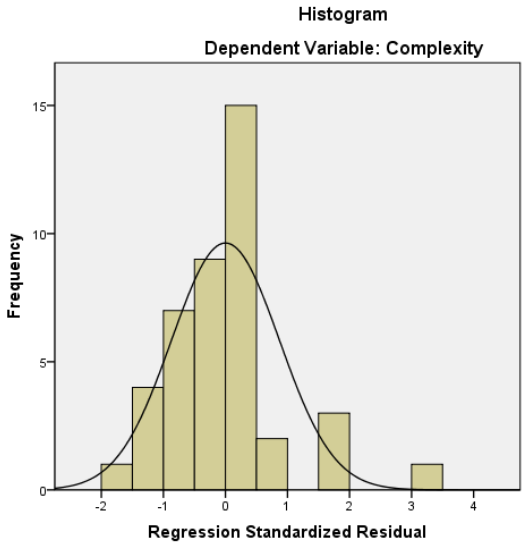

Fig-2: Histogram for data distribution

A. *Project Uncertainties spectrum:*

Ten items contributed for this research and these items have been considered by Chinese project managers during the initial interviews. These are major uncertainties which make the project management process complex. All items have been strongly agreed or agreed on the scale. On the basis of the perception of project managers and practitioners, authors have contrived uncertainty spectrum and items have been listed on the basis of average scale. "Unrealistic timescales adjustment" is measured as most contributing factor to enhance the complexity in managing projects. Adversely, frequent changes have been positioned at the bottom of this spectrum that indicates the least complexity enhancing agent in Chinese management firms. Units of uncertainty spectrum have been considered as most influencing factors for enhancing project management complexities and have been arranged in chronological order in Figure 3. Most of the project managers in interview phase emphasized over trust. Trust is imperative social substance [29] that is developed due to frequent interactions, strengthening relationships among stakeholders to become trustworthy [30, 31, and 32].

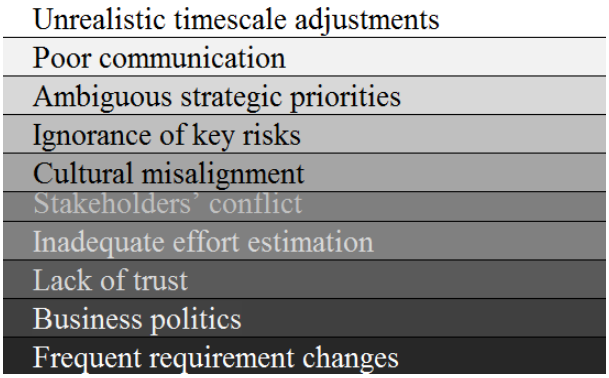

Fig-3 Uncertainty spectrum

Respondents' perception regarding each element of this spectrum has also been depicted in figure 4.

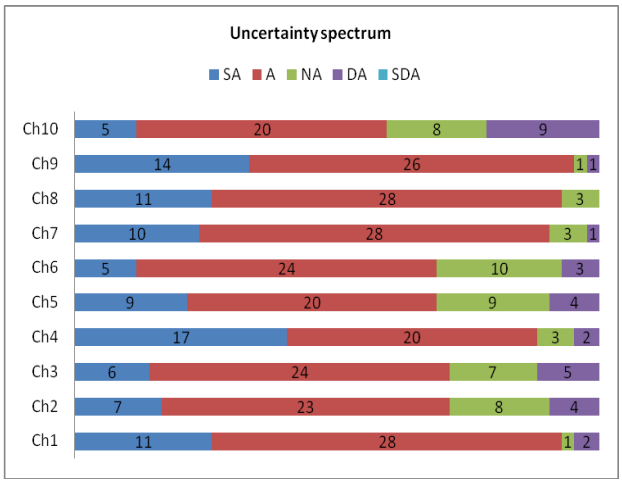

Fig-4: Respondents' frequencies for Project Uncertainty

B. Competency Spectrum to cope with uncertainties:

Chinese project management professionals suggested 8 major competencies, as tool, to overcome project uncertainties and to avoid the projects to go for complex situations. In research survey, results depicted a verity in the responses. Figure 6 has shown the intensity of each item. Breathtakingly, "future prediction techniques to assess the future risks" has been considered as not important for this study or has been disagreed by maximum respondents. On the other side, Grasping technical knowledge, Planning and scheduling and Leadership traits have got the top position in competency spectrum respectively.

Overall, this research has concluded that all these competencies are necessary and has been practiced by project professionals in Chinese economy to overcome project complexities. Researches also have emphasized on the fact that a balance between these two forces helps to manage projects. These items have been arranged on the basis of their scales on the graph in chronological order in figure 5.

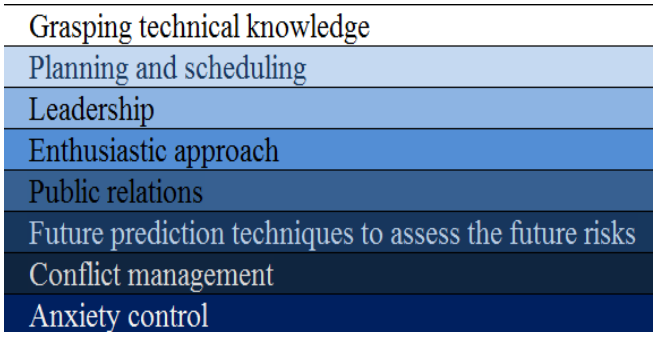

Fig5: Competency Spectrum

Respondents' perception regarding each element of this spectrum has also been depicted in figure 6.

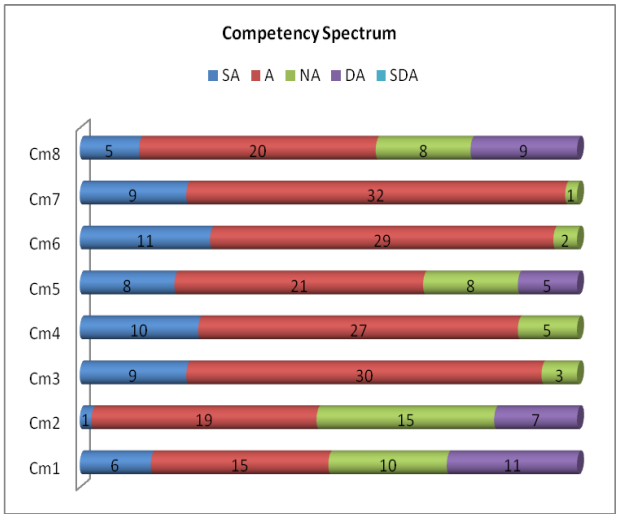

Fig-6: respondents' frequencies for Project managers' Competency

IV. CONCLUSION:

This research contribution has envisioned major issues in the form of project uncertainties which makes project management process complex. A list of uncertainties have been explored and evaluated by the project managers involved in managing complex and mega projects in the field of construction, electronics, telecom etc in China. All the experts are agreed that the uncertainty spectrum should be considered at every phase of project management seriously otherwise project may come to an end without achieving its goals. Among others, unrealistic timescale adjustments and poor communication have pushed the project managers towards complex situations. For this purpose, project tycoons have adopted various managerial traits to overcome these scenarios. Author has made an attempt to assemble these traits in the form of competency spectrum. Grasping technical knowledge and Planning and scheduling have got the top score in

competency spectrum. These competencies have helped the project managers to deal with complex situations while managing big projects. Management professionals also have strongly recommended the fact that these two poles (Project uncertainties and managerial competencies) must be aligned to overcome current challenges for managing mega projects.

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