MAPPING THE COGNITIVE STRUCTURE OF A RESEARCH SPECIALITY: A CASE STUDY OF CONDENSED MATTER PHYSICS

BY

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CERTIFICATE

This is to certify that the thesis entitled "Mapping the cognitive structure of research speciality: A case study of Condensed Matter Physics" being submitted by Shri. Sujit Bhattacharya to the Indian Institute of Technology, New Delhi, for the award of the degree of Doctor of Philosophy, is a record of bonafide research work carried out by him.

Shri. Sujit Bhattacharya has worked under my guidance and supervision and has fulfilled the requirements for the submission of the thesis, which to my knowledge has reached the requisite standard.

The results carried in the thesis have not been submitted in part or full, to any other university / Institute for the award of any degree or diploma.

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[SUJIT BHATTACHARYA]

ABSTRACT

In this study an attempt is made to uncover the cognitive structure of a research speciality — Condensed Matter Physics by analysing quantitatively the research outputs in this field in two different time periods — 1990 and 1995. The journals define the domain of this study. This domain shows progressively more complex, rich, and comprehensive picture of CMP as the set of journals is augmented in two stages. The first set concentrates on the core areas of CMP. The first augmented set offers a more enhanced picture of the research work concentrated within CMP. The second augmented set allows for the description of research work within CMP which is influenced by fields external to CMP.

The intellectual structure of this field at three different levels — Macro, Meso and Micro are sought to be described in the chosen time periods. The macro level structure is uncovered by analysing the thematic profile of journals. Meso level is analysed by looking at the substantial connections among active topics. The micro level structure is analysed by looking at significant connections among active words extracted from titles of the articles. The direct and indirect linkages, among the topics, and words, provide a picture of connections exhibited within CMP. The concept of social network analysis is utilised for providing insight into the knowledge domain of CMP. Attempt is made to define plausible research areas/topics from the blocks characterised by members exhibiting similar relational pattern. Each level is able to enrich the description of the

domain of CMP. The study shows the need for these three levels for getting a complete picture of important activities in a research domain. The dynamics of this research speciality is also captured to an extent by comparing the picture of the domain between 1990 and 1995.

The validation of the study is done by taking into consideration the views of experts actively working in this area. The basic objective of the validation has been to see the usefulness of the quantitative analysis in providing an indication of the intellectual structure in terms of defining plausible research topics, and in providing directions the field is taking. Implications of this study as an aid for the subject specialists, and policy makers are discussed.

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