

Some contextual antecedents of cognitive over-simplification processes in R&D environments: An exploration of the influence of social context on reasoning and knowledge creation practices in R&D teams

Ramkrishnan (Ram) V. Tenkasi

PhD program in Organization Change and Development
Department of Management and Organizational Behavior
College of Business, Technology and Professional Programs
Benedictine University
Lisle, IL 60532
Tel: (630) 829-6212
Fax: (630) 829-6211
rtenkasi@ben.edu or tenkasi@msn.com

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Abstract

An earlier paper (Tenkasi, 2000) advanced the view that the effectiveness of scientific problem solving and knowledge creation in R&D environments is dependent upon the quality of thinking and reasoning processes as resident in scientific deductive and inductive action. This paper also reported a qualitative and quantitative study of 25 basic pharmaceutical R&D teams wherein it empirically established that teams experiencing higher levels of cognitive over-simplification activity in their deductive and inductive processes also performed poorly in terms of R&D outcomes as indicated by termination or survival of projects.

The creative heart of scientific reasoning is a cognitive modeling process of the new problem domain to be explained, discovered or invented. The cognitive modeling act is an attempt to understand the workings of nature; a process of constructing knowledge about the underlying laws of the scientific operational environment. However, for successful scientific innovations the cognized model should progressively complexify itself so that it can become 'adaptively isomorphic' with the operational environment, a process achieved through a lengthy series of alternations between deduction and induction. In contrast to social and organizational environments that are enacted realities (Weick, 1979), scientific environments appear to represent certain innate causal laws that have to be at least approximately understood for scientific success (Woolgar, 1983; Charlesworth et.al, 1989). Thus, the quality of problem or model formulation (deduction) and the quality of information evaluation/interpretation (induction) ultimately drives the success of scientific innovation. One approach toward studying the quality of reasoning in

R&D efforts is an examination of cognitive over-simplification processes in scientific deductive and inductive action. Cognitive over-simplification processes are reliance on simple sense making rules to interpret and deal with complex and fuzzy problems that frequently arise in response to the complexity of the task environment. Such over-simplification activity can adversely impact the deductive-inductive cycle by manifesting itself in faulty framing of the problem (e.g. reasoning by simple analogy), inadequate information search and alternatives evaluation (e.g. single hypothesis bias) and biased appraisal of consequences (e.g. denying value trade-offs).

The paper proposed for this conference builds on this earlier study, in that it seeks to explore the relationship between context and cognition, i.e., whether and how do features of the social context of R&D teams influence the quality of their reasoning practices. Distinct communities of knowing develop unique interpretive/cognitive repertoires that guide their interpretations of the world, and that scientific communities are not immune from (Knorr-Cetina, 1983; Boland and Tenkasi, 1995). Knowledge, cognition and behavior in any social system are guided and constrained by the contextual rules and resources resident in the social structures (Giddens, 1979). Interpretive schemes that are standardized, shared stocks of knowledge that actors in a setting draw upon to interpret behavior and events, norms which are the rules governing sanctioned or appropriate conduct, and power that enters into human interaction by providing humans with the capabilities to accomplish outcomes, are the principal and interdependent modalities of structuration that condition human thought and reasoning. The question of interest was to explore whether variations with respect to these structural conventions of different R&D teams allow it to attain the optimal level of complexity required for scientific success. Specifically, do variations in certain features of the social context of R&D teams influence the incidence and level of cognitive over-simplification processes in scientific deductive and inductive action?

Results of a survey study with 40 basic pharmaceutical R&D teams utilizing multiple regression analysis suggested that several features of the social context were significant predictors of the level of cognitive over-simplification processes (Total variance explained 55%, $R^2 = .55$) We found that the higher the openness of group deliberative norms, availability of requisite expertise within the team, presence of cognitive diversity in mindsets among team members, presence of a shared language among different technical experts in the team, processes for accumulating past knowledge, external knowledge linkages both with the rest of the organization and the outside professional community, and integrative project leadership that involved providing fresh approaches to problems, acting as a sounding board for ideas and recognizing and mediating

conceptual conflicts, the lower the incidence of cognitive oversimplification processes in deductive and inductive action.

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