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**TRIZ Innovation Management Approach  
for Problem Definition and Product Service Systems**

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## **Abstract**

The research carried out in this thesis dealt with two strands that are closely related in their research theme. The first is pertaining to problem solving processes, specifically the problem definition stages, and the second is concerned with the role of TRIZ in developing Product Service Systems (PSS).

One of the most important developments in innovation management in the recent past is the systematic approach of making creativity and innovation learnable through generalizing knowledge and best practice for problem solving. Solution generation and evaluation attracted more emphasis while more important aspects of problem solving lie in the problem identification and definition stages. TRIZ provided the core of the generalised knowledge and best practice that many state of the art innovation methodologies look into for problem solving. This research has investigated the structure of some of these methodologies and their approaches for the purpose of identifying possible areas for enhancement in the problem definition stages. The research also presented key findings after analysing 93 case studies that were published using state of the art methodologies and other proprietary approaches.

These two research activities identified the major shortcomings in problem identification and definition stages to be related to identifying the root causes and the right system parameters involved in the root causes as well as the way by which the problem model is drawn and communicated. The research contributions to this research strand are manifested in a systematic approach for problem identification and definition called the Problem Construction Model (PCM). This model provides answers to the identified deficiencies. The research also reported an evaluation and a comparison of the PCM with other state of the art approaches.

The research for the second strand is centred on the role TRIZ can play in developing PSSs. The research investigated the state of the art in PSSs development methodologies in terms of approach, structure and tools implemented. While many of the investigated methodologies provided organisational and evaluation tools, they stayed short from incorporating TRIZ or any of its tools in the PSSs development processes and did not tackle the issues in problem identification and solution. The research contributions in this strand are a concept for developing PSSs called "Balance" and the development of 40 inventive principles for developing eco-efficient PSSs.