Alternative manufacturing developments from the semi-periphery: the case of human-centered manufacturing approach in Brazil

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ALTERNATIVE MANUFACTURING DEVELOPMENTS FROM THE SEMI-PERIPHERY: THE CASE OF HUMAN-CENTRED MANUFACTURING APPROACH IN BRAZIL

A thesis submitted in partial fulfilment of the requirements for the award of the degree

DOCTOR OF PHILOSOPHY

from

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by

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I declare that work presented in this dissertation is original, except where otherwise acknowledged.

June 1998

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ABSTRACT

The key research question of this study is to determine if Brazilian firms are applying the human-centred manufacturing approaches and if so, to explore how and to what extent this is happening. From this, two related research topics emerge: (i) how macro contextual conditions support or constrain the implementation of the HC model; and (ii) which are the main technical and organisational features of a 'tropicalized' (adapted) HC model in Brazilian firms. In order to address these questions, case studies were carried out in 10 Brazilian firms. The aim of the empirical study was to determine the form and level of human-centredness in these firms and to explore the factors affecting this. An examination was then made of the patterns of human-centred development and its links with product, process and environmental factors, identified in the literature as key influences on HC systems developments. Two theoretical approaches were used to inform the empirical component of this study in order to explain the application of New Production Systems and, specifically the Human-centred approach in the semi-periphery. Firstly, the examination at the level of the firm, integrates constructivist views of people, technology and organisation with the concept of manufacturing engineering systems as well as the organisation configuration approach. This helps to understand "how" the human-centred approach was applied in Brazil. Secondly, a political economy examination of the macro contextual factors assisted to understand "why" related questions. Key findings of this study refer to the wide range of adaptation to local conditions of new production systems. This is explained by contextual institutional factors, such as industrial relations and regional labour markets. In contrast to established human-centred theory, the degree of human-centredness in the organisational arena was not strongly linked to either (i) human-centred designed technology; (ii) to new product market variety and change; or (iii) characteristics of the firm.
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Abbreviations

AMT  Advanced manufacturing technology
APS  Anthropocentric production systems
BRITE Basic research in industrial technologies for Europe
CAD  Computed-aided design
CAM  Computer-aided manufacturing
CIM  Computer integrated manufacturing
CLP  Capitalistic labour process
CNC  Computer numerical control
CPU  Central process unit
DQP  Diversified quality production
ESPRIT European strategic program for research and development in information technology
EURAM European research for advanced materials
HC   Human-centred
HCMS Human-centred manufacturing systems
IBGE Instituto Brasileiro de geografia e estatistica
FAST Forecasting and assessment in Science and Technology
FDI  Foreign direct investment
FMS  Flexible manufacturing system
GDP  Gross domestic product
GNP  Gross national product
GT   Group technology
ITC  Indigenous technological capability
ISI  Import substitution industrialisation
JIT  Just-in-time
MES  Manufacturing engineering systems
MNC  Multinational companies
NC   Numerical control
NCMT Numerical control machine tool
NIC  Newly industrialised country
NPC  New production concepts
NSI  National systems of innovation
OEM  Original equipment manufacturer
PCF  Product customisation feasibility
PPC  Production planning and control
R & D Research and development
SBIC Study of the Brazilian industrial competitiveness
SENAI Servico nacional de aprendizado industrial
SOE  State-owned enterprise
SPC  Statistical process control
STS  Science, Technology and Society
S & T Science and technology
TNC  Transnational companies
TQM  Total quality management
TU   Trade union
UMIST University of Manchester institute of science and technology
WIP  Work in-process