

Contents

<i>List of Figures</i>	viii
<i>List of Boxes</i>	ix
<i>List of Tables</i>	x
<i>List of Abbreviations</i>	xii
<i>Acknowledgements</i>	xiii
1. Introduction	1
PART ONE: THEORETICAL AND CONTEXTUAL BACKGROUND	
2. Building Technological Capabilities in Different Theoretical Traditions	9
2.1 Introduction	9
2.2 Technological capability building in developing countries literature	10
2.3 Re-building core capabilities in the strategic management literature	17
2.4 Towards a framework for the analysis of technological capabilities	27
3. The Role of Knowledge Management in Re-building Strategic Capabilities	35
3.1 Introduction	35
3.2 Learning at the individual and organizational levels	36
3.3 Coordination of learning and integration of knowledge	46
3.4 Towards a framework for the analysis of knowledge management issues	51
3.5 Conceptual design of this book	55
4. Methodology	57
4.1 Introduction	57
4.2 Broad research strategy	58

4.3	Sources of data	59
4.4	Collecting information through interviews	59
4.5	Analyzing case study evidence	64
4.6	Writing the case study	64
5.	Overview of the Technology, the Industry and the Firm	67
5.1	Introduction	67
5.2	The technology	68
5.3	The industry	74
5.4	The Mexican and the US glass container industry	76
5.5	The case study firm: Vitro-Glass Containers	93
PART TWO: THE PROCESS OF BUILDING UP TECHNOLOGICAL CAPABILITIES FROM THE EARLIEST DAYS ON		
	Introductory Note	105
6.	The Process of Building up the Minimum Essential Knowledge Base: 1909–70	107
6.1	Introduction	107
6.2	The capability building process: Developing internal innovative technological capabilities	109
6.3	The capability building process: Use of external knowledge sources	118
6.4	Efforts to manage the use of existing knowledge	124
6.5	An assessment of the depth of the knowledge base	127
7.	Starting a Transition Process Towards Building up Strategic Capabilities, 1970–90	131
7.1	Introduction	131
7.2	The capability building process: Fast follower and external knowledge sources	133
7.3	The capability building process: Strengthening internal innovative capabilities	138
7.4	The directions of the knowledge accumulation and the emergence of embryonic strategic capabilities	147
7.5	An assessment of the depth of the knowledge base	171
8.	The Fragility of the Transition Process in the 1990s	175
8.1	Introduction	175

8.2	The capability building process: Strengthening the fast follower strategy and the focus on day-to-day activities	179
8.3	The changing directions of knowledge accumulation	188
8.4	Towards a more explicit knowledge management	200
8.5	An assessment of the transition process during the 1990s	205
8.6	1909–96: a long and devious way of building embryonic strategic capabilities but not strategic capabilities	208

PART THREE: KNOWLEDGE MANAGEMENT PROBLEMS UNDERLYING THE TRUNCATED TRANSITION PROCESS

Introductory Note	213
9. Features of Knowledge Management Contributing to the Truncated Transition Process	215
9.1 Introduction	215
9.2 The truncated transition process	215
9.3 Limited conversion of individual into organizational learning	228
9.4 Different learning strategies and limited coordination of learning	242
9.5 Limited knowledge integration	246
9.6 Instability in the knowledge creation process	250
9.7 Conclusions	254
10. Factors Influencing the Knowledge Management Features	259
10.1 Introduction	259
10.2 The non-perception of knowledge as a system	260
10.3 The instability of the dual technology strategy	274
10.4 Conclusions	294
11. Conclusions	297
11.1 Key issues of knowledge management in different stages of technological capability building	298
11.2 Knowledge management and the truncated Transition Process	300
11.3 Factors influencing the knowledge management	303
11.4 Suggestions for future research	306
Bibliography	309
Index	321

List of Figures

2.1	Different meaning of 'building technological capabilities'	27
2.2	Transition process: an unexplored area by DCL and SML	30
3.1	Links between knowledge management and the Transition Process	56
5.1	The glass container making process	69
5.2	Mexican glass container production and exports, 1970–93 (millions of pesos of 1980 and millions of dollars).	80
5.3	US glass container shipments, 1987–96 (millions of gross)	90
5.4	Sales by Vitro-Group's division, 1995 (%)	94
5.5	Sales by Vitro-Group's division, 1936–96 (%)	95
5.6	Vertical integration. Sales made inside the Vitro-Group, 1989–96 (%)	96
5.7	Sales and exports of the Vitro-Group, 1977–96 (millions of dollars)	97
5.8	Sales and exports of Vitro-Glass Containers, 1980–96 (millions of dollars)	101
6.1	Organizational chart of Vitro, 1960	110
6.2	Splitting-off knowledge from the Monterrey plant, 1932–44	115
7.1	Organizational chart of Vitro, 1987	134
7.2	Evolution of the Vitro-Group's patents granted in the US in glass container by area, 1975–95	148
8.1	Organizational chart of Vitro, 1995	180
8.2	Indicator of performance: pack to melt ratio (%), divisional data	198
8.3	Indicator of performance: internal reject (%), divisional data	199

List of Boxes

6.1	The need to build internal sources of knowledge	112
6.2	The paste mold machine for glassware products and the 'VII system'	118
6.3	The need to codify tacit knowledge about the operation	127
7.1	The project with Heye Glas: an example of positioning in bottle thickness	142
7.2	The change in the glass formula	155
9.1	Coupling equipment from different technology sources: a failure to build a strategic capability	229
9.2	How they lost a legal battle with Owens-Illinois	235
9.3	Organizational arrangements and actual practices: Implications for the research design	241
9.4	Weak knowledge integration: Coupling plunger mechanisms with molding equipment	249
9.5	The vicissitudes of the accumulation in electronic control knowledge	253
10.1	Continuous equipment upgrading and lag in learning and knowledge codification	268
10.2	The failure to recognize the potential of the new NNPB technology	292

List of Tables

2.1	Stages of building technological capabilities	33
3.1	The distinction between tacit and codified knowledge in the SML	41
3.2	Integrative mechanisms mentioned in the SML	51
3.3	Distinction between tacit and codified knowledge used in this book	53
4.1	List of development projects included in the case study	60
4.2	Sites included in the study	62
4.3	Main job positions of the interviewees	63
5.1	Definition of the industry	74
5.2	Characteristics of the glass container industry	75
5.3	Trends in the Mexican packaging market, 1990 and 1994 (%)	83
5.4	Production capacity by producer, 1995	84
5.5	Market share by main producer, 1996 (%)	85
5.6	Mexican sales by end-use, 1987 and 1994 (%)	85
5.7	Mix of products of the Mexican large producers, 1996	86
5.8	Attributes of the Mexican producers	88
5.9	Trends in the US packaging production, 1980–94 (%)	89
5.10	Market share by main producer, 1995	91
5.11	US shipped units by end-use, 1987, 1994 and 1996 (%)	92
5.12	Vitro-Group's international associations and joint ventures, 1996	98
6.1	Expansion of the production capacity	111
6.2	New production facilities established by VGC, 1924–70	114
6.3	Aims of the links with foreign suppliers, 1909–70	120
6.4	Meetings to share knowledge carried out from the 1950s	125
7.1	Aims of the links with foreign suppliers, 1970–90	137
7.2	Organization of the technology function, 1977–90	139
7.3	Organizational structure of Dirtec and main activities, 1990	143
7.4	Areas of patenting related to glass container: the Vitro-Group and its major competitors, 1995	149

7.5	Evolution of the machines to produce Coke bottles, 1946–96	158
7.6	Evolution of the machines and efficiency to produce Gerber containers, 1974–96	160
7.7	New production facilities established by VGC, 1970–89	161
7.8	Mechanisms to share knowledge, 1970s and 1980s	164
7.9	New mechanisms of knowledge codification	166
7.10	Characteristics of the visits to foreign glass container makers	169
8.1	Projects of technological upgrading, 1991–6	186
8.2	Job Changes and efficiency at the plant level, January–April 1996	191
8.3	New facilities and subsidiaries in Latin America, 1990–6	196
8.4	Indicators of performance at the plant level	200
8.5	Main organizational arrangements to increase the sharing and codification of knowledge, 1994 onwards	204
9.1	Depth of knowledge by technical-function, 1909–90s	217
9.2	Depth of knowledge by field, 1970–90s	219
9.3	Depth of knowledge in each field by organizational unit, 1970–90s	221
9.4	Main motives to undertake adaptation activities	225
9.5	Learning mechanisms and organizational arrangements, 1970–93	231
9.6	New organizational arrangements and the actual practices, 1994–7	238
9.7	Comparative assessment of the learning mechanisms based on the manager’s viewpoint and ‘how things actually worked’	240
9.8	Divisions where the organizational units were located, 1970–90s	244
9.9	Changes in the direction of the knowledge accumulation	251
10.1	Contradictory impact of learning mechanisms and organizational arrangements on the sharing of knowledge	264
10.2	Contradictory impact of the awards on certain organizational arrangements	265
10.3	Adaptation and improvements of an IS machine in the 1990s	277
10.4	Instability and shifts of Fama’s learning strategy	282
10.5	Continuous changes in the support to the knowledge creation process, 1970–90s	290