

CARLISS Y. BALDWIN

Harvard Business School
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11 Mason Street
Brookline, MA 02146

Born: September 11, 1950
Married, 2 children

EDUCATION:

S.B., Massachusetts Institute of Technology (Economics), 1972
M.B.A. (Baker Scholar), Harvard University, 1974
D.B.A., Harvard University, 1977

Thesis: "Illiquid Assets and Liquidity Preference in an Uncertain Environment"

FIELDS OF INTEREST:

Modularity, Modularization, Open Architectures, Design Commons, Boundaries and Scope of the Firm, Intellectual Property, and Real Options

PROFESSIONAL EXPERIENCE:

William L. White Professor of Business Administration, Harvard Business School, 1988-present
Course Head, Finance 2, 2009-2010
Senior Associate Dean, Harvard Business School
Director of Faculty Planning 1997-1999
Director of Doctoral Programs, 1999-2000
Director of Research, Harvard Business School, 1989-1991
Special Field Coordinator, Ph.D. in Business Economics/Finance, Harvard University, 1986-1992
Professor, Harvard Business School, 1987-1988
Associate Professor, Harvard Business School, 1981-1987
Assistant Professor, Massachusetts Institute of Technology, 1977-1981

AWARDS, HONORS:

Distinguished Scholar, Technology and Innovation Management Division, Academy of Management, 2015
Technical University Munich, Doctor *honoris causa*, 2014
Industrial and Corporate Change, Best Twenty Articles from First Twenty Years of Publication, 1992-2011
Advanced Institute of Management Research (UK) Visiting International Fellow, 2010
Technology Management Section, INFORMS, Distinguished Speaker Award, 2008
University of Vienna, Best Paper Award der Stadt Wien, (with Christoph Hienerth and Eric von Hippel), 2007
Newcomen Award in Business History (with Kim B. Clark), 1994
Bunting Institute of Radcliffe College Faculty Fellow, 1980-1982

SUBJECTS TAUGHT:

Finance 1 and 2 (MBA)
Mergers & Acquisitions (MBA)
Corporate Financial Management (MBA)
Control and Co-ordination in the Management of Organizations (MBA)
Quantitative Methods (MBA)
Enterprise Design and Valuation (Ph.D.)
Theory of Corporate Finance (Ph.D.)
Corporate Finance: An Empirical Approach (Ph.D.)
Corporate Valuation and Risk Management (Exec.)
Corporate Restructuring, Mergers and Acquisitions (Exec.)
Finance for Senior Executives (Exec.)
MIT, Corporate Financial Management (MBA)
MIT, Finance Theory II, Corporate Finance (MBA)

PUBLICATIONS:**Books:**

Design Rules: Volume I, The Power of Modularity (with Kim B. Clark) MIT Press, Cambridge, MA 2000.

Translated into Japanese, 2004

Translated into Chinese, 2006

Articles:

Baldwin, Carliss Y. "In the Shadow of the Crowd: A Comment on 'Valve's Way'." *Journal of Organization Design* 4, no. 2 (2015): 5–7.

Baldwin, Carliss Y., Alan MacCormack, and John Rusnak. "Hidden Structure: Using Network Methods to Map System Architecture." *Research Policy* 43, no. 8 (October 2014): 1381–1397.

Baldwin, Carliss Y., and Joachim Henkel. "Modularity and Intellectual Property Protection." *Strategic Management Journal* 36, no. 11 (November 2015): 1637–1655.

Lakhani, Karim R., Kevin J. Boudreau, Po-Ru Loh, Lars Backstrom, Carliss Y. Baldwin, Eric Lonstein, Mike Lydon, Alan MacCormack, Ramy A. Arnaout, and Eva C. Guinan. "Prize-based Contests Can Provide Solutions to Computational Biology Problems." *Nature Biotechnology* 31, no. 2 (February 2013): 108–111.

Henkel, Joachim, Carliss Y. Baldwin, and Willy C. Shih. "IP Modularity: Profiting from Innovation by Aligning Product Architecture with Intellectual Property." *California Management Review* 55, no. 4 (Summer 2013): 65–82.

Baldwin, Carliss Y. "Organization Design for Business Ecosystems." Special Issue on The Future of Organization Design. *Journal of Organization Design* 1, no. 1 (2012).

- Luo, Jianxi, Carliss Y. Baldwin, Daniel E. Whitney and Christopher L. Magee (2012) "The Architecture of Transaction Networks: A Comparative Analysis of Hierarchy in Two Sectors," *Industrial and Corporate Change*, 21(6): 1307–1335, December 2012.
- "Exploring the Duality between Product and Organizational Architectures: A Test of the Mirroring Hypothesis." (with Alan MacCormack and John Rusnak) *Research Policy* 41(8): 1309-1324, October 2012.
- "The Future of Organization Design," *Journal of Organization Design*, 1(1), May 2012.
- "Modeling a Paradigm Shift: From Producer Innovation to User and Open Collaborative Innovation." (with Eric von Hippel) *Organization Science*, 22(6):1399-1417, November-December 2011.
- "Where Do Transactions Come From? Modularity, Transactions, and the Boundaries of Firms," *Industrial and Corporate Change*, 17(1):155-195, February 2008. (Selected as one of the top twenty articles from the first twenty years of publication, 1992-2011.)
- "The Sciences of Design: Observations on an Emerging Field." (with S. Purao, A. Hevner, V. Storey, J. Pries-Heje, and B. Smith) Art. 29. *Communications of the Association for Information Systems* 23 (2008).
- "How User Innovations Become Commercial Products: A Theoretical Investigation and Case Study," (with Christoph Hienerth and Eric von Hippel) *Research Policy*, 35:1291-1313, December 2006. (Universtäät Wien, Best Paper Award der Stadt Wien, 2007)
- "The Architecture of Participation: Does Code Architecture Mitigate Free Riding in the Open Source Development Model?" (with Kim B. Clark) *Management Science*, 52(7):1116-1127, July 2006.
- "Exploring the Structure of Complex Software Designs: An Empirical Study of Open Source and Proprietary Code," (with Alan MacCormack and John Rusnak) *Management Science*, 52(7):1015-1030, July 2006.
- "Managing in an Age of Modularity," (with Kim B. Clark) *Harvard Business Review*, September-October 1997.
- Reprinted in:
Managing in the Modular Age: Architectures, Networks and Organizations, (R. Garud, A. Kumaraswamy, and R. Langlois, eds.), Blackwell, London, UK, 2002.
- Modularity* (M. Aoki, ed.) RIETI, Tokyo, Japan, 2002 (in Japanese).
- Markets of One* (J.H. Gilmore and B.J. Pine, eds.) Harvard Business School Press, 2000.
- Harvard Business Review on Managing the Value Chain*, Harvard Business School Press, 2000.
- "Capital Budgeting Systems and Capabilities Investments in U.S. Companies after World War II," (with Kim B. Clark) *Business History Review*, Summer 1994. (Newcomen Award for best paper published in the BHR in 1994.)

- “Capabilities, and Capital Investment: New Perspectives on Capital Budgeting,” (with Kim B.Clark), *Journal of Applied Corporate Finance*, Vol. 5, No. 2, Summer 1992.
- “Choosing the Method of Sale: A Clinical Study of Conrail,” (with Sugato Bhattacharyya), *Journal of Financial Economics*, November 1991.
- “How Capital Budgeting Deters Innovation -- And What To Do About It,” *Research Technology Management*, November-December, 1991.
- “Strategic Capital Budgeting: A Financial Approach to Investing for the Long Run,” *Cuadernos Economicas*, Vol. 42, No. 2, 1989.
- “Inflation, Uncertainty and Investment,” (with Richard S. Ruback), *Journal of Finance*, Vol. 41, No. 3, 1986.
- “Return to Nursing Home Investment: Issues for Public Policy,” (with Christine E. Bishop), *Health Care Financing Review*, Vol. 5, No. 4, 1984.
- “The Evolution of Market Risk in the U.S. Steel Industry and Implications for Required Rates of Return,” (with J.J. Tribendis and J.P. Clark), *Journal of Industrial Economics*, Vol. 32, No. 5, 1984.
- “The Resolution of Claims in Financial Distress -- The Case of Massey Ferguson,” (with Scott P. Mason), *Journal of Finance*, Vol. 38, No. 3, 1983.
- “Productivity and Labor Unions: An Application of the Theory of Self Enforcing Contracts,” *Journal of Business*, Vol. 56, No. 2, 1983.
- “Budgetary Time Bombs: Controlling Government Loan Guarantees,” (with Donald R. Lessard and Scott P. Mason) *Canadian Public Policy*, Vol. 9, No. 3, 1983.
- “Optimal Sequential Investment When Capital is Not Readily Reversible,” *Journal of Finance*, Vol. 37, No. 3, 1982.
- “Liquidity Preference Under Uncertainty: A Model of Dynamic Investment in Illiquid Assets,” (with Richard F. Meyer), *Journal of Financial Economics*, Vol. 7, No. 4, 1979.
- “Timing of Mandated Investments -- A Framework for Decision-Making,” *Sloan Management Review*, Spring 1979.

Book Chapters:

- “Modularity and Organizations.” In *International Encyclopedia of the Social & Behavioral Sciences*. 2nd ed. Edited by James D. Wright, 718–723. Amsterdam: Elsevier, 2015.
- “Return on Invested Capital (ROIC).” In *The Palgrave Encyclopedia of Strategic Management*, edited by Mie Augier and David J. Teece. Palgrave Macmillan, forthcoming. (Published online October 2013.)

“IP Modularity in Software Ecosystems: How Sugar CRM’s IP and Business Model Shape its Product Architecture,” (with Josef Watl and Joachim Henkel) in *Software Business: Proceedings of the Third International Conference, ICSOB 2012*, M.A. Cusumano, B. Iyer, N. Venkatraman, eds., Springer-Verlag, 2012.

“Evaluating the Impact of the Mozilla Software Redesign Effort.” (with Alan MacCormack and John Rusnak) in *Design Structure Matrix Methods and Applications*, S. D. Eppinger and T. R. Browning, eds. MIT Press, 2012.

“The Architecture of Platforms: A Unified View.” (with Jason Woodard) in *Platforms, Markets and Innovation*, Annabelle Gawer, ed. Edward Elgar, 2009.

“Between ‘Knowledge’ and ‘the Economy’: Notes on the Scientific Study of Designs,” (with Kim B. Clark) in *Advancing Knowledge and the Knowledge Economy*, B. Kahin and D. Foray, eds., MIT Press, Cambridge, MA, 2006.

“Modularity in the Design of Complex Engineering Systems,” (with Kim B. Clark) in *Complex Engineered Systems: Science Meets Technology* (Ali Minai, Dan Braha and Yaneer Bar Yam, eds.) New England Complex Systems Institute Series on Complexity, Springer-Verlag, New York, NY, 2006.

“The Value and Cost of Modularity,” (with Kim B. Clark) in *Modularity* (M. Aoki, ed.) RIETI, Tokyo, Japan, 2002 (in Japanese).

“Sun Wars: Competition within a Modular Cluster” (with Kim B. Clark) *Competing in an Age of Digital Convergence* (David Yoffie, ed.) Harvard Business School Press, Boston, MA 1996.

“Lessons from the Thrift Crisis,” (with Benjamin C. Esty) in *Financial Services: Perspectives and Challenges*, (S.L. Hayes, III, ed.) Harvard Business School Press, Boston MA, 1993.

“Evaluation of Government Financial Incentives to Large Scale Energy Projects: A Contingent Claims Approach,” (with Scott P. Mason), *Advances in Futures and Options Research*, (F. Fabozzi, ed.) Vol. 3, JAI Press, Inc., 1988.

“The Capital Factor: Competing for Capital in a Global Environment,” *Competition in Global Industries*, (M.E. Porter, ed.) Harvard Business School Press, 1986. Reprinted in Midland Corporate Finance Journal, Vol. 5, No. 1, 1987.

Short Pieces:

Foreward to A. Hevner and S. Chatterjee, *Design Research in Information Systems*, Springer 2010.

Preface to the Chinese Edition of *Design Rules* 2006 (published in Chinese)

Preface to the Japanese Edition of *Design Rules* 2004 (published in Japanese)

“Modularity After the Crash—Commentary on Managing in an Age of Modularity,” (with Kim B. Clark) in *Managing in the Modular Age: Architectures, Networks and Organizations*, (R. Garud, A. Kumaraswamy, and R. Langlois, eds.), Blackwell, London, UK, 2002.

"Administered Prices -- Fifty Years Later: A Comment on Gardiner C. Means, Corporate Power in the Market Place," *Journal of Law and Economics*, Vol. 26, No. 2, 1983.

WORKING PAPERS:

MacCormack, Alan, Robert Lagerstrom, David Dreyfus, and Carliss Y. Baldwin. "A Methodology for Operationalizing Enterprise Architecture and Evaluating Enterprise IT Flexibility." Harvard Business School Working Paper, No. 15-060, January 2015. (Revised April 2015.)

Baldwin, Carliss Y. "Bottlenecks, Modules and Dynamic Architectural Capabilities." Harvard Business School Working Paper, No. 15-028, October 2014. (Revised May 2015.)

Gil, Nuno, and Carliss Y. Baldwin. "Sharing Design Rights: A Commons Approach for Developing Infrastructure." Harvard Business School Working Paper, No. 14-025, September 2013. (Revised January 2014.)

Lagerstrom, Robert, Carliss Baldwin, Alan MacCormack, and David Dreyfus. "Visualizing and Measuring Enterprise Architecture: An Exploratory BioPharma Case." Harvard Business School Working Paper, No. 13-105, June 2013.

Lagerstrom, Robert, Carliss Y. Baldwin, Alan MacCormack, and Stephan Aier. "Visualizing and Measuring Enterprise Application Architecture: An Exploratory Telecom Case." Harvard Business School Working Paper, No. 13-103, June 2013.

Kuppuswamy, Venkat, and Carliss Y. Baldwin. "Risky Business: The Impact of Property Rights on Investment and Revenue in the Film Industry." Harvard Business School Working Paper, No. 13-007, July 2012. (Revised August 2012.)

Baldwin, Carliss Y. "Organization Design for Distributed Innovation." Harvard Business School Working Paper, No. 12-100, May 2012.

"When Open Architecture Beats Closed: The Entrepreneurial Use of Architectural Knowledge." Harvard Business School Working Paper, No. 10-063, February 2010. (Revised July 2010, October 2010.)

"The Mirroring Hypothesis: Theory, Evidence and Exceptions," (with Lyra Colfer), Harvard Business School Working Paper, No. 10-059, (Revised June 2010).

"The Architecture of Complex Systems: Do Core-Periphery Structures Dominate?" (with Alan MacCormack and John Rusnak) MIT Sloan School of Management Working Paper 4770-10, January 2010. Under review.

"Competition in Modular Clusters." (with C. Jason Woodard) Harvard Business School Working Paper, No. 08-042, December 2007.

"The Impact of Component Modularity on Design Evolution: Evidence from the Software Industry." (with Alan D. MacCormack and John Rusnak) Harvard Business School Working Paper, No. 08-038, December 2007. Revision invited, *Management Science*.

"From Manufacturing to Design: An Essay on the Work of Kim B. Clark," (with Sylvain Lenfle) Harvard Business School Working Paper 07-057, March 2007.

"Architectural Innovation and Dynamic Competition: The Smaller "Footprint" Strategy," (with Kim B. Clark) Harvard Business School Working Paper 07-014, August 2006.

"The Architecture of Cooperation: Does Code Architecture Mitigate Free Riding in the Open Source Development Process," (with Kim B. Clark) Harvard Business School Working Paper 03-209, June 2003.

"The Technology of Design and its Problems," (with Kim B. Clark) Harvard Business School Working Paper 02-076, March 2002.

"The Fundamental Theorem of Design Economics," (with Kim B. Clark) Harvard Business School Working Paper 02-077, March 2002.

"Modularity and Real Options: An Exploratory Analysis" (with Kim B. Clark), Harvard Business School Working Paper #93-026, October 1992.

CASES AND TECHNICAL NOTES: (partial list)

A Glossary of Technical Terms Related to Bankruptcy in the U.S., 212-081 (with Ravi Mehta and James Sharp)

Saks Incorporated, 212-060 (with Stefon Burns)

Roche's Acquisition of Genentech, 210-040 (with Bo Becker and Vincent Dessain)

The Congressional Oversight Panel's Valuation of the TARP Warrants (A) and (B), 210-035

Mellon Financial and the Bank of New York, 208-129 (with Ryan Taliaferro)

Framedia Abridged, 208-048 (with Li Jin, Li Liao, Huabing Li and Jielun Zhu)

The Auction for Burger King (A), 906-012 (with James Quinn)

The Auction for Burger King (B), 906-013 (with James Quinn)

Four Deals, 905-058

Northrop vs. TRW, 9-903-115 (with James Quinn)

The New Wachovia (A), 9-903-033 (with Jeremy Swinson)

The New Wachovia (B), 9-903-034 (with Jeremy Swinson)

Compaq's Struggle, 9-903-021 (with David Lane)

Compaq Computer Company: The DEC Acquisition, 9-800-199 (with Barbara Feinberg)

ESL Golf (A), 9-801-429 9 (with Christopher R. Gordon)

ESL Golf Model Overview and Navigation Instructions, 9-801-457 (with Christopher R. Gordon)

ESL Golf (B), 9-801-430 (with Christopher R. Gordon)

Finnigan Corporation, 9-902-045

Pepsico's Bid for Quaker Oats (A), 9-801-458 (with Leonid Soudakov)

PepsiCo's Bid for Quaker Oats (B), 9-801-459 (with Leonid Soudakov)

Evaluating M&A Deals: Introduction to the Deal NPV, 208-060

Evaluating M&A Deals-Announcement Effects, Risk Arbitrage and Event Risk, 208-103

Evaluating M&A Deals: Accretion vs. Dilution of Earnings-per-share, 208-059

Evaluating M&A Deals: Equity Consideration, 208-077

Evaluating M&A Deals: How Poison Pills Work, 208-061

Evaluating M&A Deals: Floors, Caps, and Collars, 209-138.

- Fundamental Enterprise Valuation: Introduction, 9-801-124
Fundamental Enterprise Valuation: Earnings, 9-801-124
Fundamental Enterprise Valuation: Invested Capital, 9-801-122
Fundamental Enterprise Valuation: Return on Invested Capital (ROIC), 9-801-125
Fundamental Enterprise Valuation: Capital Expenditures (Capex), 9-801-123
Fundamental Enterprise Valuation: Free Cash Flow, 9-801-126
Fundamental Enterprise Valuation: Cash Flow and Present Value Patterns, 9-902-043
Fundamental Enterprise Valuation: Advantage Horizon, 9-801-128
Fundamental Enterprise Valuation: Short- and Long-Term Growth Rates and the Growth Horizon, 9-801-127
- Technical Note on Expectations, 9-902-055
Technical Note on LBO Valuation (A), 9-902-004
Technical Note on LBO Valuation (B), 9-902-005
Technical Note on Consideration: Floors, Caps, and Collars, 9-902-056
Technical Note on Equity-Linked Consideration, Part 1: All-Stock Deals, 9-903-027
Technical Note on Equity-Linked Consideration, Part 2: Announcement Effects, 9-903-027
Technical Note on Equity-Linked Consideration, Part 3: Cash-and-Stock Deals, 9-903-027
- M&A Legal Context: Basic Framework for Corporate Governance (with Constance E. Bagley and James Quinn)
M&A Legal Context: Standards Related to the Sale or Purchase of a Company, 9-904-004 (with Constance E. Bagley and James Quinn)
M&A Legal Context: Hostile Takeovers, 9-904-005 (with Constance E. Bagley and James Quinn)
- IBM and Linux (A), 9-903-083 (with Siobhan O'Mahony and James Quinn)
Thermo Electron Corporation -- The Spinout Strategy (with Joanne Chng)
Thermo Instrument Systems -- The Turnaround Factory, 2-987-068 (with Joanne Chng)
Walt Disney Company's Sleeping Beauty Bonds
Sun Microsystems, Inc. – 1987
Consolidated Rail Corporation
Eastern Electric Apparatus Repair Company, 9-287-023
Mike Finkelstein (A) and (B)
Comdisco, Inc.
Massey Ferguson 1980

PROFESSIONAL ACTIVITIES: (partial list)

- Harvard University, Chair, Advisory Committee on Corporate Responsibility, 2014-2015
MIT, Member, Committee on Alumni Nominations to Corporation Visiting Committees, 2007-2010
Harvard University, Member, Science Technology and Management Program, Policy and Admission Committee, 2005 - 2009
Harvard University School of Design, Member, Visting Committee, 2004 - 2006
Harvard Business School, Member, Doctoral Policy Committee, 2004 - 2005
The Madeira School, Director, 2003 - 2007
Climate Neutral Network, Director, 1999-2005
Franklin Square House, Director, 1999 - 2003
Country Curtains, Inc., Director, 1995-2003

Thermolase Corporation, Director, 1994-2000
Chairman, Audit Committee 1994-2000
Federal Home Loan Bank of Boston, Director, 1983-1986, 1989- 1996
Chairman, Strategic Planning Committee 1995- 1996
Chairman, Finance Committee 1994- 1995
Chairman, Audit and Ethics Committees 1990-1993
Harvard Business School Press, Publications Review Board, 1988-2000
Harvard University, Dean Search Advisory Committee, 1995
Presidential Economic Policy Advisory Board, U.S. Council of Economic Advisers 1994
Securities and Exchange Commission, Emerging Markets Advisory Committee, 1990-1993

REFEREE: (partial list)

Academy of Management Review
American Economic Review
IEEE Transactions on Engineering Management
IEEE Transactions on Software Engineering
Journal of Business
Journal of Finance
Journal of Financial Economics
Management Science
National Science Foundation
Organization Science
Research Policy
Strategic Management Journal
Transactions in Software Engineering and Management (TOSEM)