

How HDR's Acquisition of an Economic Research and Consulting Firm Has Transformed Infrastructure Services

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This year marks the 20th anniversary of HDR's acquisition of HLB Decision Economics, an economic research and consulting firm. The acquisition merged two traditionally distinct disciplines operating in the infrastructure services market. It also added an international presence to HDR. As an engineering and architecture company, HDR designs major infrastructure projects. HLB Decision Economics provided independent, objective analysis of the economic and social value of prospective infrastructure projects. Bringing this economic expertise into HDR enhanced our advisory services and, over the long term, helped maximize the economic contribution of engineering and architectural design to our client communities.

"HLB Decision Economics enhanced our ability to add an economic perspective to design alternatives. This moved HDR upstream in the planning process and thereby created a more comprehensive service for our clients. It has also provided HDR with added insight into federal policy and new client relationships. The marriage of our two firms has proven a win-win proposition — for HDR and our clients."

Eric Keen, P.E., Chairman, HDR

There were risks for both firms. For HDR, the challenge was integrating an economics practice into the infrastructure development process. For the economics firm, the acquisition required adapting to an engineering environment while maintaining client confidence in the objectivity of its advice. Neither risk materialized. Clients looking for objective economic evaluation valued the deeper engineering knowledge that came with the integration. Existing HDR clients valued the sharper focus on value-for-money and the application of economic principles in engineering design.

"Merging our economics practice with a great engineering and architecture enterprise created an opportunity to align the infrastructure design process with the goal of maximizing the economic well-being of client communities. At the same time, our economic analysis now reflects the possibility of bettering people's lives through innovative and productivity-enhancing engineering and architecture."

David Lewis, Ph.D., HLB founder and HDR Senior Vice President (retired)

A Broader Perspective on Engineering and Economic Analysis

Connecting these two customarily distinct services meant adding economics to the design process and redefining what it means to provide objective economic evaluation of prospective infrastructure projects. Infrastructure design continues to focus on the application of state-of-the-art engineering and architecture principles and practices. In the process of applying such principles, however, HDR's perspective widened beyond the interests of design principles alone to the betterment of society, and how best to capture risk in a more robust way during project development.

At the same time, our economic analysis shifted from the static engineering economy practice of evaluating costs and benefits of defined project proposals to a dynamic interaction between designers and clients during upfront planning, alternatives selection, and design. For example, HDR recently developed a roadway design tool that allows state highway planners to follow a Performance-Based Practical Design (PBPB) approach and to make design trade-offs in relation to the net economic benefits of design options. Designers can consider the impact of their choices on the economic welfare of the community.

Integrating Risk Analysis in all Facets of Design and Engineering

As an early integrator of risk analysis into planning, HLB Decision Economics introduced risk analysis into the economic evaluation of prospective infrastructure projects. This requires formal probabilistic analysis, expert solicitation, and structured modeling to account for risk and uncertainty. The process brings stakeholders and experts into the process, promoting consensus on evidence and stakeholder-informed modeling. HDR has extended the risk analysis process (RAP) to capture the expertise of engineers and key aspects of the design process. This includes the development of Cost Risk Analysis for Value Engineering (CRAVE), wherein our Cost and Schedule Risk Analysis (CSRA) process supplements traditional value engineering. Probabilistic analysis now applies to design options at a highly disaggregated level.

Applying Cost and Schedule Risk Analysis to the Mountain View Corridor Project

A \$622 million project, the Mountain View Corridor includes 35 miles of freeway, transit and a trail system, crossing 13 municipalities in western Salt Lake and northwestern Utah counties. HDR served as program manager for the construction phases, provided oversight on the initial segments, and developed the design framework for future projects. A key part of program management involved managing the risk of cost overruns and schedule slippage. We assessed and mitigated cost and schedule risk using CSRA and CRAVE, wherein we combine probabilistic models with collaborative workshops of experts from the state department of transportation, contractor and designer. Results included significant cost savings and on-schedule project delivery.

HDR's Sustainable Return on Investment (SROI) methodology further extended the risk analysis process. SROI estimates the economic, environmental and social benefits, and the costs and rate of return for infrastructure project alternatives. This "triple bottom line" approach

internalizes return on investment analysis in the search for environmentally, financially and economically sustainable project options. This methodology has evolved further into a comprehensive sustainable value assessment (SVA) that embraces economic techniques including benefit-cost analysis (BCA), economic impact analysis, multi-criteria analysis, and value-based decision-making. Other applications of the risk assessment process include failure mode analysis for estimating damage risk and assessing resiliency, credit risk assessment for forecasting revenue, probabilistic cost forecasting, risk-based asset management, and utility rate analysis. HDR now employs risk analysis widely throughout its design and planning program.

Ensuring Sustainable Return on Investment for the Holland Board of Public Works

When Holland, Michigan, needed to retire its aging power generation plant, the community and city officials reimagined how a power plant could support the community. HDR considered a broad range of fuel options, including coal, gas, wind, solar and biomass. The community worried about electricity rates, economic development and emissions of all types. As standard electricity planning models look only at internal costs, Holland BPW added SROI to its planning and community involvement efforts to address residents' concerns.

Holland BPW engaged the community and a wide range of stakeholders in two risk analysis workshops open to all Holland residents. Local radio and newspapers covered the sessions, and an engaged community closely followed the decision process. HDR used SROI to quantify the net benefits and risks of different energy futures for the utility and to spell out the impacts for different stakeholder groups. The resulting design exceeded expectations by providing a 26-acre park with natural wetlands and trails, a visitor center, and the world's first power plant to earn a platinum rating from the Institute for Sustainable Infrastructure's Envision program.

HDR's 2027 Strategic Plan reflects our aspiration for continued integration of economics into our engineering and architecture practice. The plan establishes HDR's role as "a client-centered professional services company focused on improving humanity." HDR provides objective advice while considering the economic concept of maximizing social welfare (the metric of choice for operationalizing the goal of improving humanity). We engaged this approach soon after the acquisition of HLB Decision Economics in a project to reconfigure part of the interstate highway system into a toll road. Through a business case analysis conducted at the start of the project, HDR found the conversion to tolling, while technologically feasible, financially and economically unsound. Since no design options exhibited positive economic outcomes, HDR determined that the project would not serve the best interests of the public. As a result, HDR recommended terminating the project, along with our own multimillion-dollar design contract. By considering public benefits and social welfare, HDR has helped elevate our communities, industry, and profession.

Recognizing the Twin Roles of Productivity and Fairness in Engineering Design

HDR's broader societal outlook led the firm to recognize that while the public requires **more** infrastructure investment, it must also be **better** investment. The use of BCA to evaluate projects proposed for discretionary grant applications reflects sound economic principles. Upfront analysis of net project benefits, feedback into the proposed project, and alignment of projects to meet public objectives characterize HDR's integration of economics into planning and the engineering design process.

HDR recognizes that the chief hope for economic growth comes not just from the quantity of capital formation (e.g., more roads, buildings and utility services) but also from improved productivity through more efficient and better suited infrastructure technology. For the public sector, where market forces cannot be relied upon to direct investment dollars to their highest and best use, special effort must be made to direct the vast amount of infrastructure money now available to productivity-enhancing infrastructure. By evaluating public benefits through BCA, HDR has helped optimize more than \$4.9 billion in federal discretionary transportation grants that enhance productivity and social welfare.

BCA remains the gold standard for determining the net merit of proposed new projects. HDR recognizes that while BCA accounts for benefits and costs, it does not recognize how benefits and costs might be different for people with higher and lower income. Just as a poor person might value a dollar more than a rich one does, people with lower incomes could value the benefits of infrastructure projects more highly than people with higher incomes. Economists call this phenomenon the "diminishing marginal utility of income."

From 2022 to 2023, HDR funded an internal research fellowship to explore ways of accounting for the diminishing marginal utility of income into BCA. The research culminated in an analytic procedure that better accounts for the value of projects to disadvantaged communities and people with lower incomes. This aligns project design options with a fuller range of societal needs. Such needs include transit alignments that unite neighborhoods divided by major roads, greater accessibility for people with disabilities, and engineering and architectural advances that accommodate a wider range of individuals. HDR now works with agencies and project sponsors to consider this approach in the planning process.

A related procedure incorporates the concept of fairness into flood resilience planning. This new procedure improves the prioritization of design alternatives to help ensure that underserved communities are not overlooked. All this helps recognize that some people are at flood risk but lack the socioeconomic resilience to recover quickly from flood events. The Atmospheric River Control (ARC) Spillway project illustrates this perspective.

The Atmospheric River Control (ARC) Spillway Project

The ARC Spillway Project adds a second spillway to the New Bullards Bar Dam to reduce flood risk and enhance public safety for Yuba and Sutter counties in California. When analyzing the impacts of a generational project such as the ARC Spillway, HDR seeks to understand how the project benefits the specific communities that it protects.

By recognizing variations in the value of money for people at different income levels, our economic evaluation of design alternatives for the ARC Spillway Project accounts for the greater value of key design elements for the poorest people in the community. This reduces their risk of life-altering floods and enhances their resiliency in a changing climate.

Conclusion: A Transformation in Both Engineering and Economics

HDR now makes economics a core element of our services. Our staff of full-time economists has more than tripled over the past 20 years, with economists joining over 20 HDR offices across North America and in the Middle East. The net result has transformed the infrastructure design process, mainstreamed economic evaluation services, and been a game changer for our clients. At HDR, engineering and architecture services now embrace the wider goal of infrastructure investment – namely, the provision of socially beneficial capital investments and economic growth through improved productivity. At the same time, economic analysis recognizes a role for engineering design in maximizing economic welfare. HDR continues to push boundaries. Our independent and objective economic evaluation, financial forecasting, and risk analysis are proving transformative for our clients.

About the Authors



Eric L. Keen
Chairman, HDR Board of Directors

Eric Keen serves as chairman of HDR's Board of Directors, after directing the company as CEO and as its former president, chief operating officer and engineering company president. As CEO, he led the 100% employee-owned firm through eight acquisitions and oversaw continuous revenue growth and the addition of more than 2,600 employees.

A civil engineer by training, Keen has spent his career helping develop and deliver some of the United States' most notable transportation infrastructure projects, including the Whittier Access project in Prince William Sound, Alaska; the Legacy Parkway project in Salt Lake City, Utah; and the Arthur Ravenel Jr. Bridge in Charleston, South Carolina.

Keen was instrumental in establishing the firm's transportation alternative delivery practice, and under his leadership, the transportation practice grew its planning, program management, design-build and management consulting services to complement an already strong design practice.



David Lewis
HLB Decision Economics Founder, former Senior Vice President, HDR

David Lewis, Ph.D., has held numerous leadership positions in the field of economics.

Trained at the London School of Economics, Lewis has served as an economist and policy analyst in the private sector and for Canada's Office of the Auditor General, the U.S. Congressional Budget Office, and the Greater London Council in the U.K.

Lewis founded the consulting firm HLB Decision Economics, acquired in 2005 by HDR, where he served as a senior vice president and chief economist before retiring in 2014. He is internationally recognized for his research and applied work in cost-benefit analysis, social policy, and public infrastructure economics and finance.



Chris Williges

Director of Economics and Statistics, HDR

Chris Williges is the director of HDR's economics, finance and statistics practice. He has more than 30 years of experience conducting transportation planning, economics, engineering and strategic assignments for public and private sector clients. He has been with HDR for the past 11 years; prior to that, Williges served as vice president of System Metrics Group.

He has overseen the development of a wide range of analysis tools involving revenue forecasting, regional economic models, benefit-cost and financial models, and asset

management systems.