

Informational Architectures of the SSA and Knud Lönberg-Holm

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Abstract. This paper offers an account of the unusual proto-systemic and informational approach to architecture that emerged in the early 1930's within the largely unknown Structural Study Associates (SSA), a circle of architects around Buckminster Fuller. It examines the design of a dynamic information system for architects by SSA members Knud Lönberg-Holm and Carl Theodore Larson and compares them to pre- and post-war knowledge indexing systems and world projects. This study also explores the systems-oriented positions outlined by these architects. This provides a view of American architecture of the era that counters the one presented by the canonical International Style Exhibition of 1932, which essentially edited out the more variegated approaches to modern architecture and technology as represented by the SSA and especially Lönberg-Holm.

Introduction

In 1932 a loosely knit coterie of productivist architects known as the Structural Study Associates, or SSA, rallied behind Buckminster Fuller's short lived editorial project in the magazine, *Shelter: A Correlating Medium for the Forces of Architecture*.¹ They propagated a radical technologist and productivist manifesto that anticipated the systems and communication theory that emerged in the post-war era. Their position regarding advanced technology and information has a contemporary resonance. Already in the early 1930s, the SSA introduced such seemingly postmodernist terminologies as *performance*, *emergence*, *emergency*, *ephemeralization*, *biologic design*, *networks*, *mobility*, *flows*, *decentralization*, *ecology* and *entropy*. They promoted a research based, macro-scale systems approach, modeled at the time on the flow of energy.

With the motto: "Don't fight forces use them", they insisted on the term *environmental controls* instead of architecture. Their vision of an advanced technosociety promoted a nomadic, tensile, metallic dwelling unit as well as a data-driven design culture predicated on free divulgence of continually updated information. The SSA promoted architecture as instruments, the outcome of the service-minded mediation of technology for the benefit of the community.

Some of the later projects put forth by SSA members might be seen as particular case studies of a proto-history of systems and informational architectures that emerged in the context of the magazine *Shelter* and the economic and social crisis of the American Depression. *Shelter* acted as publicity platform for promoting Buckminster Fuller's Dymaxion house as "Universal Architecture". But beyond his apparent protagonism, beginning in the 1930s Knud Lönberg-Holm (1895–1972) and Carl Theodore Larson (1903–1988), two architects who emerged from the SSA, became information specialists, and Fuller's fellow travelers. They began an unusual collaborative project to create a

dynamic, constantly evolving database of information related to community design and environmental controls. They sought to use postwar CIAM as an international platform.

Their wartime publication *Planning for Productivity* [1940] and the post-war *Development Index* [1953] (fig. 1) are also essentially knowledge indexing proposals, which can be compared to a selection of similar pre-war and post-war encyclopedic and world projects based on the retrieval, centralization and transmission of knowledge, including Buckminster Fuller’s Geoscope of 1962. Within these projects they reformulated design according to unsentimental scientific criteria: as the effective transformation and arrangement of energy into flow patterns for productive use. They also theorized information flow (fig. 2).

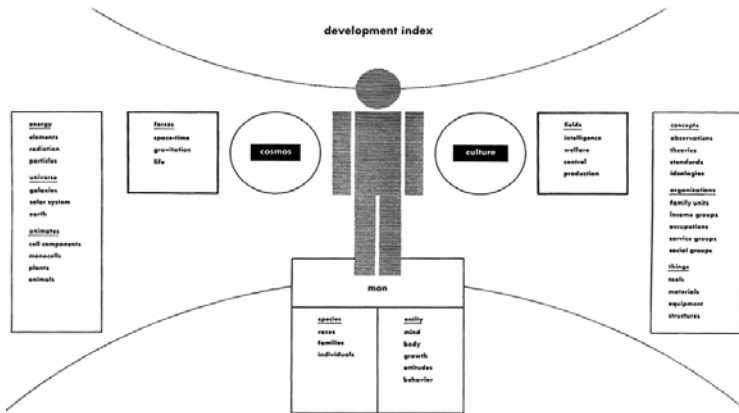


Fig. 1. “Man, Cosmos, and Culture” from *Development Index* [1953]

As a class of projects that processes data and indexes knowledge, Lönberg-Holm and Larson’s proposals share an affinity with early modern *World projects*, such as the World Brain, the World Encyclopedia, the World City, World Auxiliary Languages and the International System of Typographic Picture Education. Such systems were put forward by diverse figures in the inter-war period including novelist H. G. Wells, Wilhelm Ostwald, winner of the 1909 Nobel prize in chemistry, Paul Otlet, and Otto Neurath.

Such world projects, aimed at the centralizing and standardizing of all knowledge in one single location and unifying norms for international use, find their precursors in incipient global networks of standards and conventions.²

In their pre-war manifestation, these projects point to the impact of Taylorization on knowledge systems – the storage, classification and retrieval of complex data – as information specialists theorized the management and dissemination of publicly available data, the development of institutions and unifying systems in a pre-digital era. Information technologies were themselves subject to the processes of scientific management. *Planning for Productivity* and the *Development Index* might be situated somewhere between those modernist World Indexing projects, including Buckminster Fuller’s broadcast conning station that appeared in *Shelter*,³ and his later, and more multimedia Geoscope mentioned earlier, a proposal for a floating informational globe, with constantly updated real-time data transmission about the earth. The projects of Lönberg-Holm and Larson carried forward the common credo and positions outlined in the depression-era in *Shelter* magazine.

III a. information flow

Since the development index is made up of factors arranged in closely related functional sequences, it can be readily expanded or changed to accommodate new advances in knowledge. The various factors can be easily cross-checked, thus permitting emerging as well as existing relationships to be identified and appraised for their value in the development of new forms and patterns.

The index does more than adapt itself to a changing flow of information. It can also stimulate and nourish such flow. By analyzing current records (books, articles, reports, etc.) and then coding these documents with specific index numbers covering all pertinent factors referred to, an inventory of information can be built up which will be so organized that pertinent data on any specific development problem can be readily pulled together from a variety of sources, then collated and issued as an integrated unit of information.

In this sort of information flow the index functions as a twofold screening system. First, in the analysis phase, it can serve as a means of identifying the various factors which constitute any existing form or pattern. Second, in the synthesis phase, it can serve as a means of selecting the various factors which should be considered in the creation of any new form or pattern.

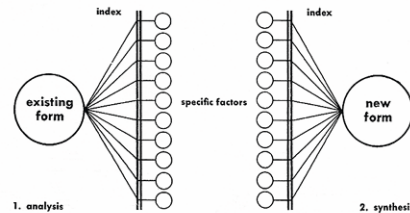


Fig. 2. "Information flow" from *Development Index* [1953]

The Structural Study Associates (SSA) and Shelter

The non-commercial *Shelter* magazine was founded in 1930 by Beaux Arts trained George Howe, an architect with William Lescaze, renowned for his Philadelphia Savings Fund Bank, the first skyscraper in the US designed in the International Style. Starting as the very local *T-Square Club Journal* in Philadelphia, in its two years of existence, it went through three changes in title, design and editorial direction, ending with a national projection and the radical technologist position of the SSA. Its seventeen issues performed a special role in the debates surrounding modern architecture in the United States. Divisive viewpoints often coalesced in the same issue, between architects in the same camp, those promoting a modern architecture. Contributors included traditionalists, housing reformers, and internationalists who presented modern architecture as a received European style, and the SSA, who looked to native technological sources.

In 1932, the Structural Study Associates joined Buckminster Fuller in taking over *Shelter*, rebuking the formalist, aesthetic agenda and classifications of the International

Style Exhibition held at MoMA, curated by Henry Russell Hitchcock and Philip Johnson, then also associate editors of *Shelter*.⁴ Instead the SSA decisively called for an architecture predicated on the latest technological advances in materials and structures.

While placing the emergency situation of the American Depression in the foreground, they remapped the country as an abstract, networked, national space based on mobility, energy, resource systems, communication and transportation infrastructures. With extra-architectural imagery – electric power lines and tensile engineering – their magazine was dense with charts, diagrams, news clippings, scientific information, technical reports and economic data. They held that the evolutionary nature of technology would have a transformative social value, representing one of the most extreme versions of such thinking in architecture at the time, a critical moment when modern architecture was being promoted in the US and when the term and modern conception of “technology” first came into general and widespread usage. By the 1930s technology could be thought of as an autonomous agent of progress, an independent mode of thought, instrumentality in and of itself.⁵

1932 was statistically one of the worst years of the Great Depression, the last year of Herbert Hoover’s presidency and the prelude to Franklin Delano Roosevelt’s propelling the New Deal. At the time, Technocracy Incorporated, a group of engineers, scientists, economists and architects, had attracted an enormous popular national following. This ideological movement arose out of a think tank, Technical Alliance, commissioned to create an energy survey of the US.⁶ In 1930 Buckminster Fuller had met the group, whose leader was Howard Scott, based in Columbia University’s engineering department.⁷ But he never joined. Technocracy INC, believed in autocratic rule by technical specialists to bring the United States productive capacity to optimal level. The founders were disciples of the economist Thorstein Veblen, whose book *The Engineers and the Price System* [1921] had suggested that a “Soviet of Technicians” should rebel against absentee factory owners, to bring the country to full production inherent in the machine age.⁸

The SSA, a group mainly formed of editors of professional magazines with access to information about the building industry, were clearly Fuller’s “Soviet of Architects” and they drew on Veblen’s writings in their aim to overhaul the obsolete building industry and their belief in “industrial emancipation”. They were also clearly indebted to the extra large scale framework of the contemporary Technocracy Incorporated, drawing on their protocols involving resource and energy surveys, economic indexes, thermodynamics, charts and correlations of industrial production [Technocracy Incorporated 1934]. In the post-war period Fuller would be assimilated into ecologist movements, but the SSA’s systems paradigm, circa 1932, had its origins in the hierarchical and centralized national electric grid. The SSA put their emphasis on environmental controls, defining design as the harnessing and deployment of flows of energy.

Knud Lönberg-Holm: architect of information

Some of the SSA members played an important role in promoting a modern architecture in the US, based on advanced technology. Such is the case of the little known Danish émigré architect Knud Lönberg-Holm, who completely abandoned practice to transform the outmoded building industry, a central aim of the SSA in *Shelter*. His professional trajectory, a myriad of simultaneous and largely anonymous collaborations, concentrated on organizational modes, communication and information technologies from within a special field. He was involved in the refinement and designing

of instrumental architectures and systems transforming quotidian practice in the 1930s as Beaux Arts compositional modes were supplanted by modernist diagrammatic practices and objective scientific protocols.

Lönberg-Holm arrived in the US via Germany in the early 1920s, where he had been affiliated with De Stijl and international constructivist collectives. Respected by his peers, his career is mostly forgotten, appearing mainly in the footnotes of studies on the period. His unsubmitted Chicago Tribune Tower of 1922 was published by both Walter Gropius and Le Corbusier in Europe.⁹ He contributed sixteen photographs of cityscapes and high rise steel construction to Erich Mendelsohn's *Amerika, Biderbuch eines Architekten* [1926], although the images were not credited until the book's sixth edition. The extreme vantage points introduced by the Danish architect had an impact on later images by Rodchenko and El Lissitzky.¹⁰

He represented the US in the first exhibition of modern architecture held in America in 1927, organized by the *Little Review* and focused on constructivist architecture [Heap 1927]. In 1924 he taught at the University of Michigan, thanks to the introduction by Eliel Saarinen, promoting De Stijl elementarist principles in his design studio.

His projects and essays throughout the period offered European colleagues an incisive critical portrait of American architecture and urbanity [Lönberg-Holm 1924, 1928]. Lönberg-Holm maintained close ties to vanguards in Europe as the east coast delegate to CIAM from 1928-1959, along with Richard Neutra, his west coast counterpoint. With *Shelter* magazine as a platform of dissemination, he acted as a transatlantic conduit. He elaborated the Functional City plans of Detroit presented by Cornelis van Eesteren at the fourth CIAM congress in 1933 and developed the theme of the post-war renewal congress held in Bridgewater, England, in 1947. His insistence on collectivity, cooperative group research, scientific and analytical models, central planning, and the role of the technician in the cultural sphere can be correlated back to his longstanding involvement with CIAM, where he held on to the organization's foundational premise focused on building, technology and standardization.

Already in the 1920s, Lönberg-Holm was involved in refining and designing instrumental architectures, organizational systems for architects' data, the consolidation of normative modernist practices and information infrastructures. His anti-formalist position closely resembled that of the radical materialist Swiss ABC group, which included communist architects Mart Stam and Hannes Meyer. Like them, he sought the scientization of architecture, and viewed standardization as a radical premise in a mass technological society.¹¹ Lönberg-Holm merged Buckminster Fuller's interest in native vernacular technologies and the American roadside culture of mobility with a position very close to that of Hannes Meyer. Architecture was an apparatus responding to the needs of body and mind. Building was a biological process, the organization of function and new building materials in a constructive whole based on economic principles that were to be determined by life rather than art. But his positions were veiled within the technical news and research departments of America's capitalist architectural corporations.

As a technical editor at *Architectural Record* magazine from 1929, Lönberg-Holm reformatted the magazine according to the tenets of New Typography, promoting a modern architecture based on scientific innovation and criteria of performance.¹² He contributed to the whole ambit of information systems developed in tandem with that magazine, including *Sweets Catalog*, an essential compilation of product information of

evolving building materials, which paradoxically played a critical role in the corporization of everyday practice.¹³ His aim had been to make it possible to create radical designs of the 1920s, such as Mies van der Rohe's glass skyscrapers with standardized manufactured components.

As the director of design and research at *Sweets* from 1932 to 1960, he reconfigured this industrial system with Czech graphic designer Ladislav Sutnar, creating a theory based formulation for applying modernist techniques to knowledge management, which goes beyond typography, to pioneer *information design*.¹⁴ His most significant contribution to *Shelter* magazine critiqued the mass, weight, deadload permanence and immobility of empty skyscrapers in the early 1930s as monuments of the collapse of the acquisitive capitalistic system in the Depression, in favor of architecture as instruments [Lönberg-Holm 1932].

Before he was hired in 1929, *Architectural Record* editors rejected his essay "Architecture in the Industrial Age" [1967]¹⁵ as far too radical for the professional architectural press. The text took a holistic, anti-aesthetic approach to the problems of building, community, new technologies, advances in science, and the transformation of the profession in the face of such changes. His essay urged city planning based on the organic functions of a community and its culturally based space organizing process. It charged that science had changed man's relation to nature and to society and that new needs would lead to the reorganization of life and society to reflect that new reality.

He called for the creation of an economically independent research institute to deal with architecture in an industrial age where collective problems could be collectively investigated. The objective of such an institution was to "act as a clearing house for individual research"; to foment "the research work-analysis of problems, the determination and definition of types and norms" [Lönberg-Holm 1967: 22]. This program would later be proposed by him in the context of post-war CIAM and within the informational systems that he designed with SSA member Carl Theodore Larson.

Design for environmental controls and the technician on the cultural front

Within the *Sweets* research department, Lönberg-Holm developed a series of independent collaborations with Larson that present a radically scientific definition of design and aimed to create a comprehensive non-corporate information system for architects in the international arena. The Harvard-educated Larson served as an associate editor at *Architectural Record* from 1930-1936 and became a member of the SSA in 1932. In 1948, as a professor at the University of Michigan, he founded a research laboratory dedicated to prefabricated housing, one of the SSA's key concerns. Over the course of their collaborations, which lasted until the 1970s, Lönberg-Holm and Larson kept as much abreast of evolution in information technologies as in material production.

In 1936, the two architects had been effectively demoted to *Sweets Catalog* from *Architectural Record*, based on the controversy surrounding two co-authored texts which labeled them as red suspects, advocates of the Soviet system.¹⁶ "Design for Environmental Controls" [1936a] and "The Technician on the Cultural Front" [1936b] are effectively technological manifestos with affinities to Buckminster Fuller and their former involvement in *Shelter* magazine. They approached design based on the interrelation of invisible forces of energy beyond any tradition of architecture. These articles formed the conceptual base for their later projects and offer a systems approach to design.

Lönberg-Holm and Larson analyzed environmental forces in terms of two classifications of motion or energy: as human activities that included biologic and social forces; and as matter in the form of solids, liquids, gases, and electromagnetic radiation. Invisible forces had transformed human shelter from protection into controls of environmental forces [Lönberg-Holm and Larson 1953]. The purpose was to increase the life of human organization. Changeable forms of energy constituted the very materials of design, defined as the effective transformation and arrangement of energy into flow patterns for productive use: “New and unthought of forms impossible with traditional means of production are thus implied” [Lönberg-Holm and Larson 1936b: 155].

Planning for Productivity and the Development Index

As an alternative to the corporatism of *Sweets*, Lönberg-Holm and Larson also postulated a dynamic, comprehensive system of research and information management dealing with all aspects of environmental controls. *Planning for Productivity* [1940] was rejected by *Sweets*, but instead found an outlet with the International Industrial Relations Organization founded in the 1920s by Mary van Kleek, a social feminist and advocate of Soviet socialism who was engaged in promoting international planning as the solution for putting resources in the service of all the world’s people, productivity as a means of social progress, and technology as a source of abundance.¹⁷ The book proposed centralized planning, and cycles of performance for materials and buildings. The authors sought a rehaul of the building industry with centralized research and information systems to allow for advanced productivity.

Their proposal was essentially a skeletal schema of all topics related to environmental controls, specific flow patterns that conform to the changing needs of man, and a “Production Index” dedicated to continually updated information. This project was presented to CIAM, which would then have an impact on Lönberg-Holm and Larson’s later collaboration on the *Development Index* [1953]. Their reformulation of design paradigms was based on a wholly scientific conception of dynamic interrelated forces, energy flows, networks and productivity.

The *Development Index* [Lönberg-Holm and Larson 1953] studied the interaction of human activity, environmental relations and communication and would appear to be more closely aligned with synergetics, the dynamic geometry and whole systems approach that Buckminster Fuller developed in the postwar era, here adapted to a proposal for a dynamic communication index of concepts related to the built environment. It is a diagrammatic outline of correlations between cosmos, man and culture, a pattern for the organization of knowledge, a non-static indexing system; a master switchboard for data flow and a tool of research to be updated constantly in line with “new expansions in human knowledge”.

Larsen and Lönberg-Holm saw advanced productivity as leading to a surplus of leisure and based once again on the cycles of: 1) Research (analysis); 2) Design (synthesis), 3) Production (formation); 4) Distribution (dispersion), 5) Utilization (performance); and 6) Elimination (termination) (fig. 3). Emergent needs would be met with new forms and patterns (fig. 4).

b. development cycle

The development of any new form or activity pattern can be analyzed as a process comprising six characteristic and interacting phases:

1. research (analysis)
2. design (synthesis)
3. production (formation)
4. distribution (dispersion)
5. utilization (performance)
6. elimination (termination)

To achieve a rhythmic and balanced continuity in development, there must be a progressive elimination of the old along with the emergence of the new. Such continuity requires a close correlation between the research and elimination phases of the development cycle.

This definition of development does not imply any deliberate destruction of the old merely because it is old, nor does it demand the creation of something new solely for the sake of novelty or as a change in "fashion". So long as the old serves a need, it clearly should continue in use. The objective in developing new forms and patterns is to satisfy those emerging needs of man which cannot be met adequately by existing forms and patterns.

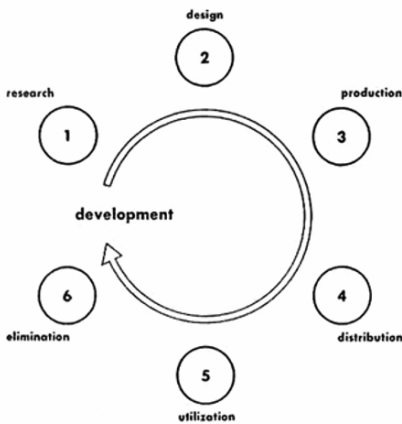


Fig. 3. "Development cycle" as part of the chapter on "Man and Development" in Lönberg-Holm and Larson, *Development Index* [1953]

a. development goals

Implicit in the term "development" is a concept of man as an entity which strives endlessly to reach an undefined wholeness and completeness. Such emergence is expressed by an increasing variety of human needs. In satisfying these needs, man has available all the resources of his environment, including himself.

Development thus becomes a problem of continually perceiving new needs and transforming the various environmental relationships into new forms or patterns of activity that will serve man to ever better advantage. By creating new forms to meet new needs, man increases the wealth of resources at his command. In the process more needs are created which call for a further development of the available means.

With increasing control of environment an increasing surplus of human energy is released from the drudgery and uncertainties of mere existence. This surplus – leisure – becomes available for still greater degrees of control. As the environmental limitations are removed, man's own capacities for growth are extended progressively. Such development can be continuous and unlimited.

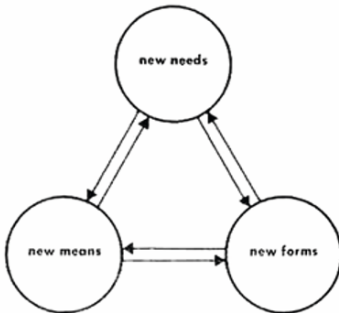


Fig. 4. "Development goals" as part of the chapter on "Man and Development" in Lönberg-Holm and Larson, *Development Index* [1953]

3.1. fields of activity, field pattern

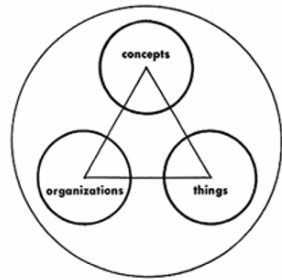
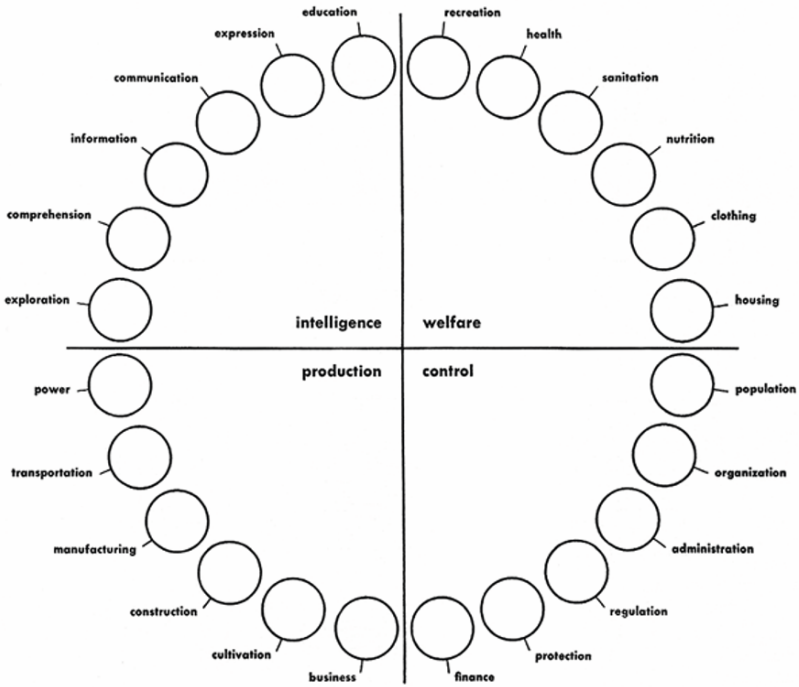


Fig. 5. "Fields of activity, field pattern", from *Development Index* [1953]

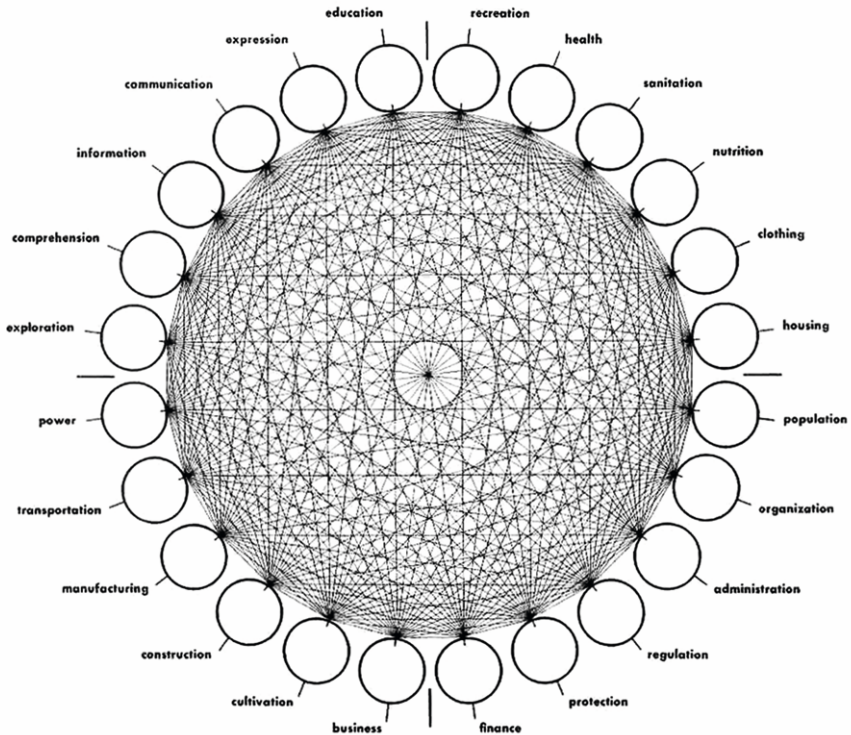


Fig. 6. “Community relationships” from *Development Index* [1953]

Development Index offered a complex relational system; an attempt to identify and organize into operational unity all the factors to be considered in the development of forms and patterns that will further man’s growth. It was meant to act as a twofold screening system for managing information flow and servicing relevant data, where a central collection and dissemination department would coordinate the organization of development information, alongside of decentralized units. This would make use of state-of-the-art media such as microfilm, microprints, and electronics.

World Indexing Projects

Planning for Productivity and *Development Index* are essentially diagrammatic organizational outlines for modern knowledge apparatuses that bridge the pre- and post-war years. These projects were not inconsistent with the context of CIAM, and the organization’s attempt to distinguish itself from existing planning institutions and define an international role in planning. In this context, Lönnberg-Holm offered a global specialized information system. The comprehensiveness of the outline and the compression of the texts drew on his experiences in CIAM’s organizational culture of questionnaires and checklists to establish broad thematics. He had been promoting the idea of an institution to centralize information about building and aid in architectural research since 1929 and he now saw it as essential within the context of CIAM’s post-war reconstruction efforts, and new planning developments.

Lönberg-Holm and Larson's schematic formulation to create a constantly evolving database of all information related to environmental controls is also in line with the ambitions of World Encyclopedic projects. Modern era internationalization had truly begun with transportation paradigms – global networked infrastructures such as railroads, steam ships and telegraphy – in the mid-nineteenth century. The first decade of the twentieth century held the promise of Nikola Tesla's World System for wireless telegraphy (1910) and the creation of norms and standard arrangements, ranging from the first international meeting for world traffic conventions, held in Rome 1908, to a World Palace to house all of the knowledge in the world. Originally, international organizations before the League of Nations dealt with technological interdependence and were organized by engineers. Concern for the unification and standardization of knowledge was theorized by proponents of newly-established world organizations. Such *World Projects* made an inflationary use of their prefix and expressed a totality of range, taking the scope of the projects to the maximum, which therein held the seeds of inevitable incompleteness.

The advocates overlapped around 1930. A World Encyclopedia was proposed by Paul Otlet but also by Otto Neurath, father of ISOTYPE, and again by H. G. Wells, who called such a mechanism for the systematic ordering of human thought, the "World Brain" (1938). These projectors imagined an apparatus capable of receiving, sorting, summarizing, digesting, indexing and networking primary materials. Lönberg-Holm was familiar with Otto Neurath and the "Mundaneum" from CIAM. *Shelter* magazine had published texts by H.G.Wells, as well as C.K. Ogden's *Basic English*.

For his "Mundaneum", the unrealized architectural embodiment of an all-world knowledge database designed by Le Corbusier, Otlet developed the first modern systematic organization of information, based on his own universal decimal system and a mechanical data base that resulted in twelve million cross-referenced 3 x 5 index cards.¹⁸ In his 1933 futuristic novel *The Shape of Things to Come*, H. G. Wells envisioned a central collection bureau located in Barcelona where all forms of knowledge would be snipped and edited by experts into an international information mechanism. Wells's project for a World Brain was to be controlled by a World State and proposed the editing, distilling, sorting and collecting of data, with totalitarian overtones.¹⁹

Ogden's Basic English would be the lingua franca of the new ruling elites. Charles K. Ogden (1889-1957) was a British linguist educated at Cambridge University and a disciple of Victoria Lady Welby. He began promoting Basic English in 1930, as part of International Language Reform, one of several World auxiliary languages such as Esperanto, conceived to promote world communication and universal understanding. Ogden took a technological approach to language and its operational context, applying functionalism. He reduced the 25,000 English words found in any standard dictionary into basic concepts that could be achieved with only 850 words, some of which acted as *accelerators, lubricants, accessories or gadgets*. Ogden was influenced by the English philosopher of law and utilitarianism and the inventor of the panopticon, Jeremy Bentham (1748-1832), whose 1812 *Theory of Fictions* he published in 1932. Bentham had been the inventor of the terms *international, utilitarianism, minimize and maximize*. Ogden based his language on what he called the *panoptic affect*, meaning that the words could be understood at a glance. The language attracted the attention of world leaders after World War I, including Winston Churchill and Franklin Delano Roosevelt, as well as the SSA in *Shelter*. Lönberg-Holm wrote in Basic English, and so did Neurath.

On a more mundane level Wilhelm Ostwald formulated projects for a single currency or World Money, a World Auxiliary Language, Ido (a variant of Esperanto), the World Format, a universal system of paper sizes as well as a standardized color system. Neurath, the first non-architect member of CIAM, proposed ISOTYPE, a universal sign system as an international picture language, based on icons that could be understood across cultures.

But new technologies, communication and information theory emerging out of World War II consigned such paper-based World projects to oblivion and radically transformed data collection and storage media from newspaper clipping agencies and index card catalogues to memex, microfilm, incipient computerization and other electronic documents, as described by Vannevar Bush in his expose "As We May Think" [1945], a seminal post-war text on the future of information processing. This represented a move from a modernist desire to centralize and monumentalize knowledge to a post-war conception of globalized networks.

Epitome of Navigation

On another level, Fuller's influence might also be felt in "*Planning for Productivity*" and "*Development Index*", based on his involvement in systems theory in the post-war period. Fuller had conceived of *Shelter* as the standard reference on par with the American Practical Navigator, a manual for mariners. Initially published in 1803 and continually updated since, the book was authored by Nathaniel Bowditch, a self taught mathematician, a student of celestial bodies and a Unitarian seaman from Salem Massachusetts. "Bowditch", or the "Epitome of Navigation" as it was known, could be found on every US Navy vessel and was the western hemisphere's shipping industry standard for more than 150 years. The original text included several novel solutions to the spherical triangle problem, as well as extensive formulae and tables for navigation. Fuller's experience in the Navy was decisive in shaping his world view and gave him the experience of working within a closed system that was capable of processing and deploying vast quantities of information, resources and new technologies. Maritime standard manuals such as "Bowditch" emphasized the gathering and interpretation of positioning data as essential to the seafarer.

Indeed, for Fuller and any sailor, the world itself was a complex information system, and the "Comprehensive Anticipatory Designer" was a nomadic roamer who could process information from industry and other technocratic sources while remaining an outsider. Such an elite figure would be "a Harvester of potentials" peripheral to rationalized bureaucratic industrial systems, yet able to analyze and deploy the products of technocracy to serve the world's needs. The Geoscope and World Game of the 1960s were concerned with whole systems analysis and continually updated information exchange.

On a more personal level, Fuller's Chronofile, begun in 1915 with closure upon his death, is a chronologically organized archive of Guinea Pig B's personal development correlated to major world events and to scientific and technological inventions. The Chronofile and the Dymaxion Index were inspired by Fuller's Navy experience following World War I, when he had to compile secret records in chronological order, a problem of information indexing. Fuller, a proponent of lightness and ephemeralization, amassed a time capsule of private and world information that eventually weighed in at 45 tons or 90,000 pounds of paper, scraps and clippings that had to be sorted, indexed, bound and carted about throughout his nomadic entrepreneurial existence.

Role of the mass media of information

The more holistic outlook of *Development Index* had benefited from Lönberg-Holm's involvement in CIAM and the influence of the younger generation on community, collectivity, and the idea of Habitat as an environment to accommodate the total and harmonious, spiritual, intellectual and physical fulfilment of the inhabitants. It also carried forward the aims of CIAM to develop universal standards for community developments for the benefit of man. *Development Index* was informed by Larson's connection from the early 1950s on to Kenneth E. Boulding of the Department of Economics at the University of Michigan from 1949-1967, a leading figure in evolutionary economics and general systems theory, and the organizer of an interdisciplinary seminar on the Integration of the Social Sciences, which included a session on the "Theory of Information and Communication".²⁰ Through this affiliation, Larson may have been first introduced to "General Systems Theory" by Ludwig von Bertalanffy and Claude Shannon's "Communication Theory".²¹

The final incarnation of this unusual collaborative effort in information indexing was updated in 1972 due to new advances in technologies. "Role of the Mass Media of Information" [Larson and Lönberg-Holm 1972], published by Martinus Nijhoff in the European Cultural Foundation's Plan Europe 2000, was one of seventeen prospective studies for *The Future is Tomorrow*. The essay cited Claude Shannon and Marshall McLuhan projecting the beneficial role that globalized mass media could have including possibilities of mass education through distance learning via television and computers, and advances in art such as Robert Rauschenberg's collaboration with MIT's Experiments in Art and Technology. It explored the obsolescence of paper-based and microfilm systems for the computer, this time evoking Teilhard de Chardin's notion of super intelligence arising from accelerated technological progress.

Lönberg-Holm and Larson's ongoing collaboration in information systems, for the coordinated deployment of up-to-date data essential to community design are case studies that propagate a notion of building as environmental controls, conceived as the deliberate organization of the processes of life where building ceases to be monument and becomes instrument. Surprisingly, their interest in systems and information emerged within the context of the Great Depression and developed throughout World War II. They represent an anomalous and extreme position that originated in the 1930s with their collaboration with Buckminster Fuller in *Shelter*, one that has been obscured by the predominance of Hitchcock and Johnson's streamlined account of the architecture movements of the time.

Notes

1. The SSA was formed by Knud Lönberg-Holm, Carl Theodore Larson, Douglass Haskell, Charter Secretary of AUDAC and the Nation's architectural critic, a contributor to the *New Republic* and *Architectural Record*; *Architectural Forum* editor Roger Sherman; Peter Stone of *American Contractor*, formerly of *General Building Contractor*; the practitioners Henry Churchill and Simon Bienes; Frederick Kiesler; the Austrian born theatrical designer who Fuller knew from avant-garde circles in Greenwich Village; Eugene Schoen, founder of AUDAC and creator of Macy's interiors; Howard Robertson of the Architectural Association London; Henry Wright, community planner, War Department and City Housing Corporation, NYC, Radburn and Buhl Foundation, connected to Lewis Mumford; Dr. Alvin Johnson, political economist, editor of the *New Republic*, and president of the New School of Social Research; William Adams Delano, a Columbia professor and designer of public buildings in Washington; Electus Litchfield, an architect of public housing; A. Lawrence

- Kocher, director of *Architectural Record's* editorial policy and designer of Williamsburg, Virginia; his partner, Swiss-born architect Albert Frey; Maxwell Levinson, technical editor of *Shelter*, and his brother Leon Levinson, managing editor.
2. For a further examination of such knowledge indexing projects, see [Rayward 2008] and [Krajewski 2006].
 3. See [SSA (Anonymous) 1932]. Fuller's description of the tower states:
There could be mechanical hook-ups of industrial unit production headquarters by teletype, telephoto and television with central publishing headquarters of industrial units, who in turn would be tactically hooked up in like manner with information sources such as Bureaus of Standards, Navigation, Department of Commerce, etcetera or corporations such as Standard Statistics, Consumers' Research, Science News Service, etcetera, as well as university hook-ups [SSA 1932: 64].
 4. As George Howe removed himself from *Shelter* magazine, Maxwell Levinson, the technical editor sought financing. Buckminster Fuller cashed out his life insurance policy to be able to take over the magazine, but by then Levinson had already procured financing from Philip Johnson as well.
 5. See [Marx 1994]. In this essay, Marx discusses the "invention" of the term technology derived from the Greek *techné*, meaning "art" or "craft" and its availability since the seventeenth century. At the turn of the century, Thorstein Veblen would introduce the term "machine technology" into modern discourse in the United States. Leo Marx also traces the assimilation of the word into general usage in the 1930s.
 6. Organized by Howard Scott, the 1918 think tank Technical Alliance was commissioned by the International Workers of the World to conduct an energy resource survey of the United States with the aim of industrial restructuring. The engineer Charles Proteus Steinmetz and Thorstein Veblen were listed as members of the coterie, along with economist Stuart Chase, the New York architects Frederick Lee Ackerman, Robert Kohn, and Charles H. Whitaker, and the forester Benton MacKaye (all founding members of the Regional Planning Association of America), and engineer Bassett Jones, among others. The group dissolved in 1921, without ever publishing findings.
 7. Howard Scott, Harold Loeb, and Walter Rautenstrauch, a Columbia professor of industrial engineering, all formed splinter groups: Technocracy Incorporated, Committee on Technocracy, and Continental Committee on Technocracy, respectively. At the onset of the Depression they received much attention in the media, until Howard Scott's professional credentials were called into question
 8. Tosten Bunde Veblen (1857-1929) was born in Wisconsin to Norwegian immigrant parents. He became Thorstein Veblen, an economist who applied Charles Darwin's Theory of Evolution to the analysis of modern industrial systems. He was the founder of institutional economics in America; John Kenneth Galbraith, among others, is considered to be a later disciple. Writing at the time of the creation of mergers and trusts among American corporations, he became one of the first critics of finance capitalism and investment banking manipulations. His work studied the dynamics of market competition and processes and sought to overcome material scarcity. See [Veblen 2006].
 9. His unsubmitted Chicago Tribune competition entry, 1922 was influential in Europe, published by Le Corbusier in the *Almanach d'architecture moderne* (1925) where it was juxtaposed with towers by Mies van der Rohe and with a residential skyscraper by Auguste Perret. It also appeared in Walter Gropius's article in *Internationale Architektur Bauhausbücher*, no1 (Munich, 1925).
 10. For a further explanation of Lönberg-Holm's images included in Mendelsohn's *Amerika* see [Cohen 1995, 1992]. In this French edition all of Lönberg-Holm's photographs are identified.
 11. The ABC group included pro-communist architects from Basel: Hannes Meyer, Hans Wittwer, Emil Roth, Hans Schmidt and Paul Artaria and the Zurich architects Werner Moser, Max Ernst Haefeli and Rudolf Steiger. The group produced a journal from 1924 to 1928. Of the eight issues, the first and second served as tributes to Lissitzky. For a detailed study of the ABC group's publication and built work see [Ingberman 1994].

12. Lönberg-Holm's articles for the Technical News and Research Section of *Architectural Record* included the following articles: "New Theatres in Europe" (May 1930: 490-496); "The Gasoline Filling and Service Station" (June 1930: 561-584); "Heating, Cooling and Ventilating the Theatre" (July 1930: 93-94); "The Week-end House" (August 1930: 175-192); "Glass" (October 1930: 327-358); "Recent Technical Developments; Reducing dead load, saving time and increasing control" (December 1930: 473-482); "Planning the Retail Store" (June 1931: 495-514); "Trends in Lighting" (October 1931: 279-302); "Technical Developments" (January 1932: 59-72); "City Planning, Survey of Detroit, Michigan with Otto Sen and S. Washizuka" (March 1933: 148-149).
13. *Sweets Catalog*, an interface between architects, builders and manufacturers, has been taking up an enormous amount of shelf space since 1906. It still exists as a voluminous compendium of trade catalogs by fabricators of building material, currently used monthly by 200,000 American construction professionals in the field – architects, engineers and contractors – and is organized according to the same categories used in the writing of architectural specifications. *Sweets*, a clearing house for standardized industrial building parts and a binder for collecting and classifying commercial trade catalogues of products, was made available to architects just at the moment that the building industry in the United States was converting from small-scale localized trades to national business structures based on advertising and consumer culture.
14. The most comprehensive source of information about Sutnar, both his early career in Prague and his emigre years in New York, can be found in the exhibition catalogue [Janáková 2003].
15. See [Lönberg-Holm 1967]. This was originally written in 1929 for *Architectural Record* but rejected. The article itself gives an explanation of the protracted publication time.
16. This is revealed in a letter from Lönberg-Holm to Larson dated April 22, 1965 in the Larson Papers.
17. The International Industrial Relations Organization lasted from 1928-1948 and its aim was to improve the life of workers. Van Kleek emerged as an early reformer for women workers. She visited the Soviet Union in 1932 and advocated social and economic planning.
18. Paul Otlet (1868-1944) was a Belgian lawyer and a pioneer in information science and documentation. He created the universal decimal classification system. As a visionary he conceived a number of World projects including the *Palais Mondial* or World Palace (later called the Mundaneum) and the *Cité Mondiale* or World City, which would house all of the world's international organizations. Otlet promoted the global diffusion of information and experimented with new media such as microfilm developed in coordination with engineer Robert Goldschmidt. After World War II Otlet and his work faded into oblivion, to be recently resurrected as a precursor to the World Wide Web.
19. H. G. Wells (1866-1946) was a prolific writer known for science fiction and utopian novels and a member of the socialist Fabian society. *The Shape of Things to Come*, 1933 envisioned the world being taken over by a world council of scientists. He developed the idea of the World Brain in *The Idea of a Permanent World Encyclopedia* in 1938. See [Rayward 1999].
20. From a prospectus in the Larson Papers (1954 March 24). The first seminar dealt with a theory of competition and cooperation and brought to together academics in ecology, forestry, psychology, social psychology, group dynamics, sociology and economics; the second covered theory of individual behaviour; the third general theory of growth; the fourth dealt with theory of Information and communication.
21. In the early 1960s they collaborated on a project for windowless classrooms with the anthropologist Edward T. Hall, author of the *Silent Language* and the *Hidden Dimension*. The project was directed by Larson as a collaboration between the Department of Architecture at the University of Michigan and the Ford Foundation's Educational Facilities Lab, Inc. It was an interdisciplinary collaboration that involved insight from psychologist, sociologists and others (from a Memo of the Department of Architecture March 1962, in the Larson Papers). Larson also corresponded with Hall regarding his work on "A Systems Approach to the Performance Concept in Building" (from a Letter dated February 21, 1966 from Larson to Edward T. Hall in the Larson Papers).

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