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Development Index, A Proposed Pattern for Organizing and Facilitating the Flow of Information Needed By Man in Furthering His Own Development, With Particular Reference to the Development of Buildings and Communities and Other Forms of Environmental Control.

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The organization of knowledge related to the development of the environment and the building industry is provided in this index which provides a framework or classification system for a broad range of information. Man's development in terms of environmental structuring and control is discussed as development goals, development cycle, and development means. The subdivision within the index includes--(1) the cosmos or natural sciences, (2) man's physiology, and psychology, and (3) culture as fields of activity, concepts, organizations, and things. The discussion also mentions information flow, research questionnaires, and servicing of information. Details are given for questionnaires directed toward the discovery and analysis of dwelling and community needs. (MM)

development index

by K. Lönberg-Holm and C. Theodore Larson

development index

a proposed pattern for organizing and facilitating the flow of information needed by man in furthering his own development, with particular reference to the development of buildings and communities and other forms of environmental control

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preface

That giant segment of American economy, the Building Industry, has awakened to the fact that its progress depends upon a science of building.

Practitioners of the arts and technologies of building are seeking information in their own and other fields of specialization. Their curiosity extends into the human and social sciences, now recognized as a source of facts truly fundamental to building technology. Naturally, the social scientists show equivalent needs for technical data.

The big question is, "Where and how do we find what we need to know?"

The knowledge of building, like all human knowledge, is increasing at an exponential rate. Research accelerates the accumulation of new data. But much of this wealth of knowledge is virtually inaccessible – all for lack of an adequate system of indexing and documentation. Attempts to classify building literature by ordinary methods inevitably fail when the system of indexing becomes as complex as this most complex of subjects itself.

What is this science of building? It cuts across almost every field of human activity. Until we understand its framework and can see a pattern, there can be no integrated and dynamic system of documentation to maintain the flow of data that must exist for full-fledged building research and development.

Holm and Larson have placed the huge and shapeless form of building knowledge before an X-ray so penetrating that every bone and fiber come to view. They have boldly broadened the focus to catch the outer limits of the science where it merges into the cosmos of all human development.

The picture they have printed proves there is a skeleton, a true framework that has so far escaped definition. They have proceeded to name the parts and show their logical order. They consider their work to be exploratory. Their purpose in publishing the Development Index at this time as a research study progress report is to inspire others to join them in occupying and colonizing a new frontier of discovery.

As a pattern for the organization of knowledge in general, the Index should be helpful in bringing together, in operational unity, the work of specialists in various fields of activity. In doing so, it should make possible the development of a truly integrated and dynamic system of documentation for the building industry – one which will assure the orderly assembling and sorting of new data and the progressive removal of obsolete data. To the building researcher and technician this is a paramount need.

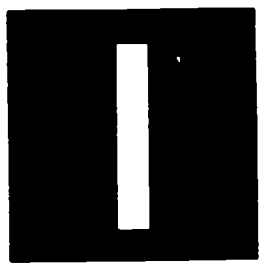
William H. Scheick, Executive Director
Building Research Advisory Board
National Research Council

index development

A development index for the building industry
was originally proposed by the authors in their publication,
'Planning for Productivity',
issued in 1940 by the Industrial Relations Institute, New York.
Recently this earlier work has been restudied
and its central idea revised and refined –
a task that has been facilitated by advice and encouragement
from Dean Wells I. Bennett and Professor Walter B. Sanders,
College of Architecture and Design, University of Michigan,
and from Chauncey L. Williams,
Vice President of the F. W. Dodge Corporation, New York.

In its present form,
the index merely outlines the various series of factors
involved in development relationships.
Certain sections have been amplified
because of their special significance to the building industry.
Other sections need similar amplification.
It is therefore hoped that this task will be furthered
through the active cooperation of interested specialists.
Since the form of the index must always be kept changing
in line with new expansions in human knowledge,
its development calls for a broad and continuous program
of research on all fronts.

man and development



Unique among all forms of life, man has advanced
in a relatively recent stage of history
to a point where he seeks to change and adjust his environment
to serve his own needs of growth and development.
With man's increasing knowledge of his environmental forces,
physical and cultural,
he becomes increasingly able
to bring favorable relationships into existence
and to eliminate those which he deems undesirable.

As a variable form of energy, man himself
functions as an environmental force,
affecting and in turn being affected by other forces.
These relations between man and his environment
are always in flux;
they imply a wide and constantly changing
range of development for man.

This extension of man's control over his environment
can be analyzed
as a process involving three aspects of development:

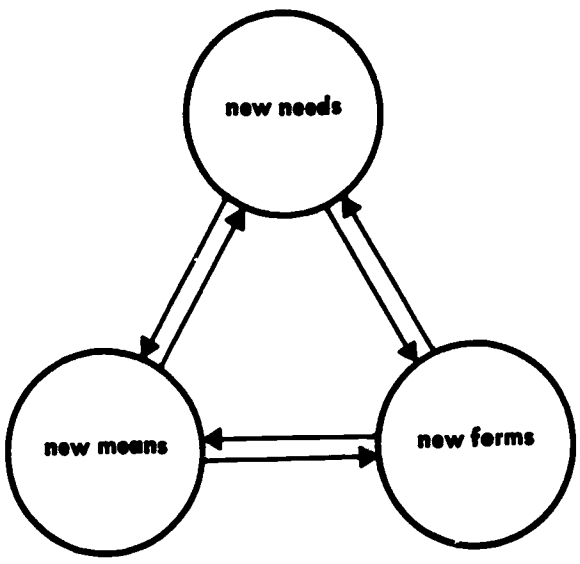
a. development goals
b. development cycle
c. development means

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.



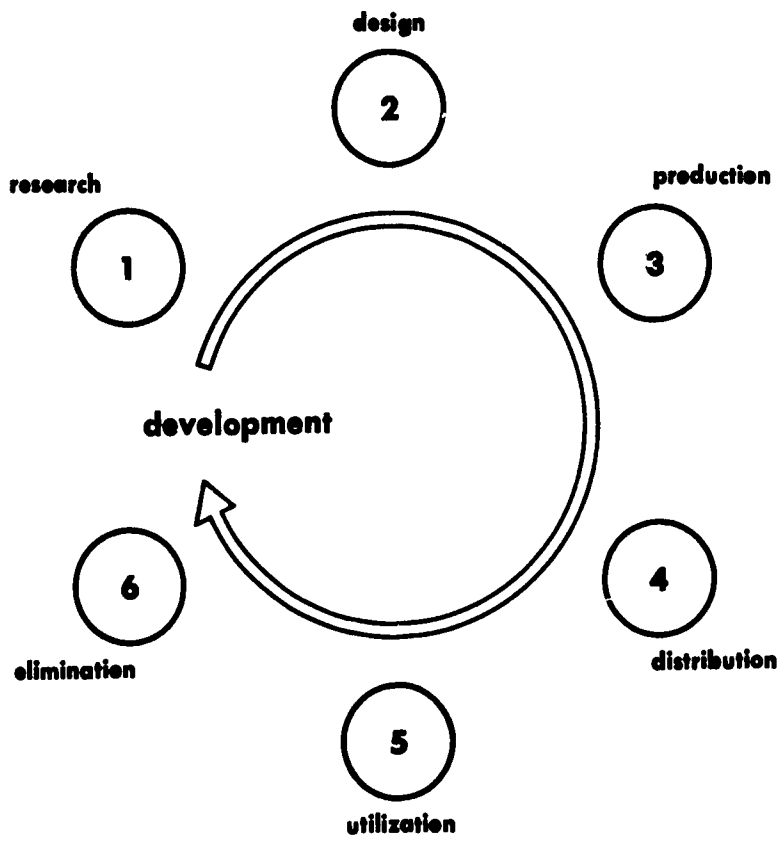
b. development cycle

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.



c. development means

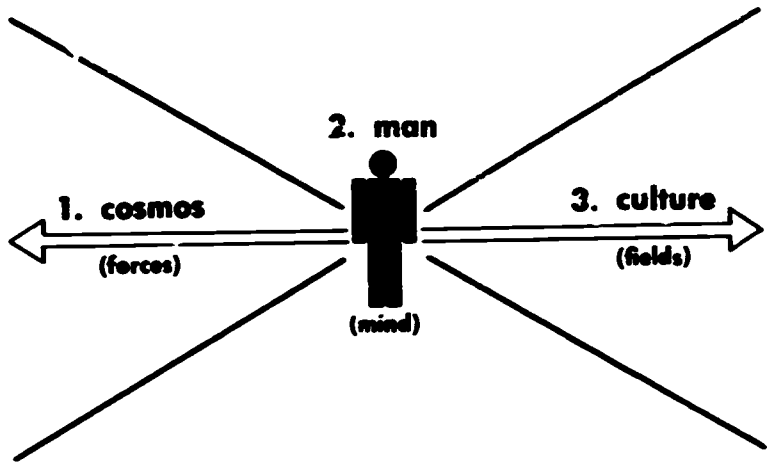
The environmental resources which man has available
for development purposes
can be grouped into three main categories:

1. cosmos (natural forms and patterns)
2. man
3. culture (man-developed forms and patterns)

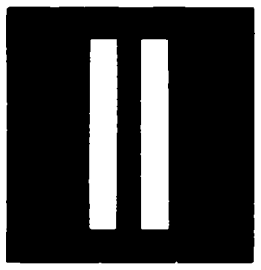
Each category is a distinct system
comprising several characteristic series of related factors,
as shown by the development index (on following pages).
Yet all three must be considered as having an essential unity.
Culture cannot exist without man,
and man clearly is a part of the cosmic system;
culture grows out of man just as man has grown from the cosmos.

This essential unity is expressed
in the cross-ties between the three categories.
The human mind, insofar as it represents a cosmic force,
also becomes a controlling factor
in determining the scope and direction of development
in the various fields of human activity.

The series of factors within each category
must always be changing and expanding,
for development implies a continuous emergence of new knowledge
about the cosmos and man and culture.
The development index
seeks to facilitate the inclusion of such new knowledge
by keeping the factors within each series
in as close a functional sequence as possible
so that changes may be readily made whenever necessary.



development index



a proposed pattern
for sorting and selecting the flow of information
needed by man in furthering his own development

1. **cosmos**
2. **man**
3. **culture**

II

1

cosmos

1.1. forces
1.2. energy
1.3. universe
1.4. animates

1. cosmos

1.1. forces

1. space-time

2. gravitation (electricity, magnetism)

3. life

II 1. cosmos

1.2. energy (matter)

1. elements

2. radiation

    1. subsonic vibrations
    2. audible sound
    3. supersonic vibrations
    4. electric waves
    5. hertzian waves
    6. infrared waves
    7. visible light
    8. ultraviolet waves
    9. x-rays
    10. gamma rays
    11. cosmic rays

3. particles

    1. nucleons
    2. electrons
    3. mesons
    4. massless particles
    5. probable particles

1. cosmos

1.3. universe

1. galaxies

2. milky way galaxy

3. solar system

    1. sun
    2. planets

4. earth

    1. envelopes (ionosphere, stratosphere, atmosphere, etc.)
    2. structure (crust, core)
    3. areas (land, water)
    4. behavior (climate, weather, etc.)

II 1. cosmos

1.4. animates

1. cell components

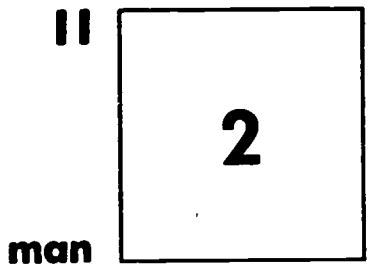
   (protoplasm, viruses, enzymes, genes, etc.)

2. monocell structures

   (bacteria, yeasts, protozoons, etc.)

3. plants

4. animals



2.1. species

2.2. entity

II 2. man

2.1. species

1. races

2. families (genealogical groupings)

3. individuals

II 2. man

2.2. entity

1. mind

2. body (structure and functions)

    1. bone system
    2. muscular system
    3. vascular system
    4. respiratory system
    5. nutritive system
    6. reproductive system
    7. glandular system
    8. nervous system

3. growth (life cycle)

    1. conception
    2. gestation
    3. birth
    4. youth
    5. maturity
    6. senescence
    7. death

4. attitudes

    1. positive (helpful)
    2. negative (harmful)
    3. neutral (indifferent)

5. behavior

    1. individual
    2. group

II

3

culture

3.1. fields of activity
3.2. concepts
3.3. organizations
3.4. things

3. culture

3.1. fields of activity

1. intelligence

    1. exploration
    2. comprehension
    3. information
    4. communication
    5. expression
    6. education

2. welfare

    1. recreation
    2. health
    3. sanitation
    4. nutrition
    5. clothing
    6. housing

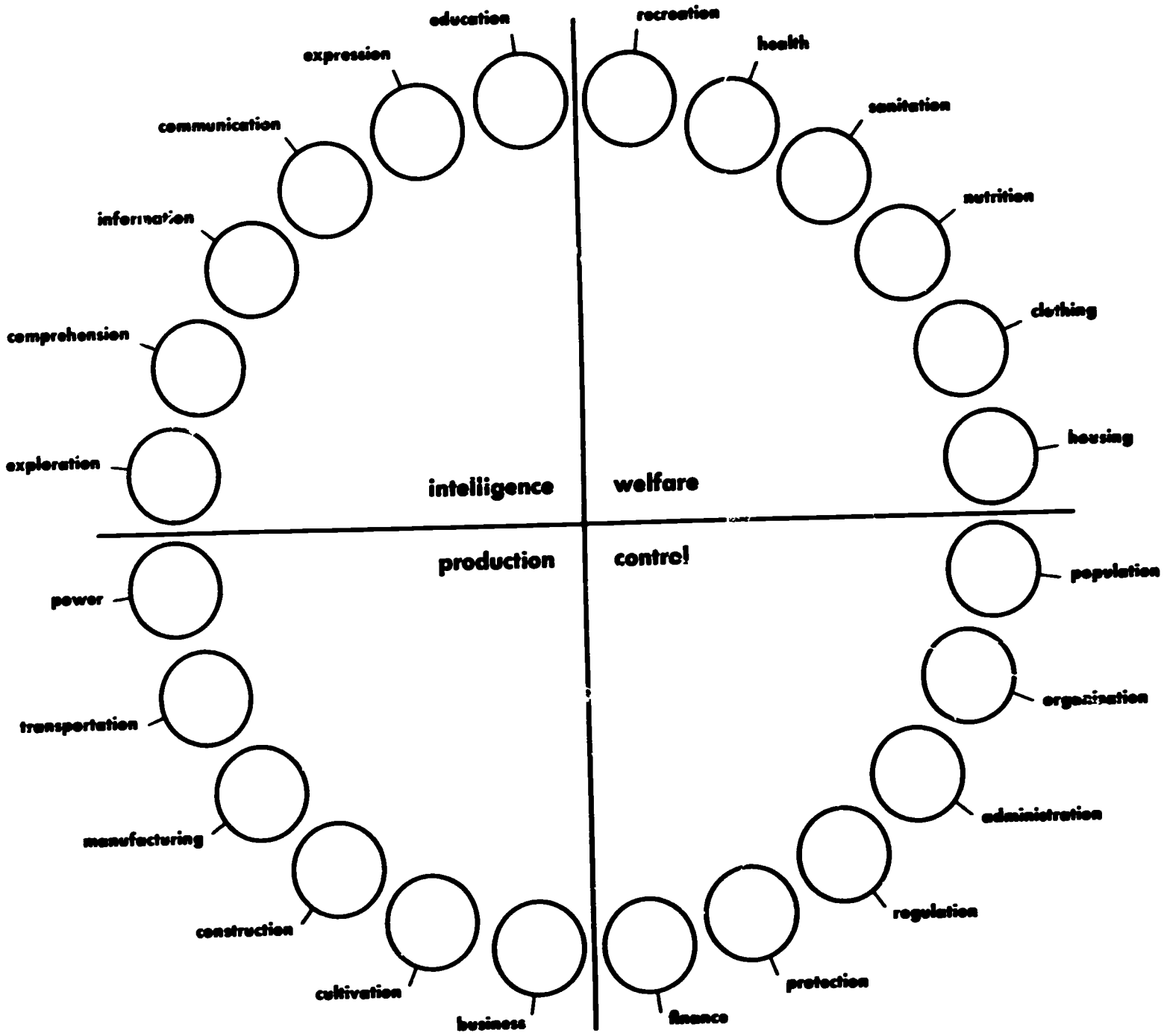
3. control

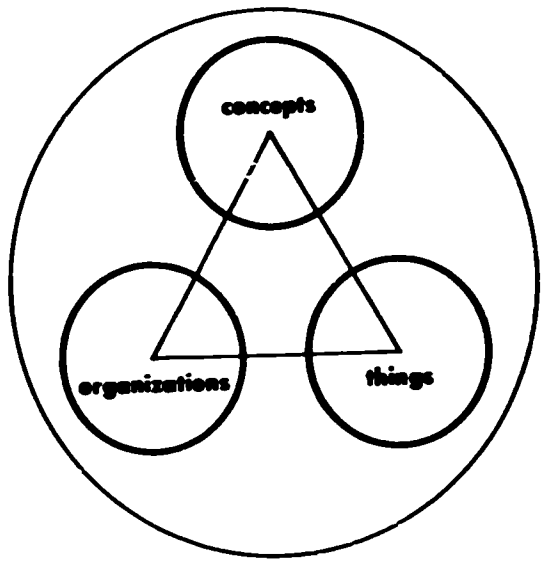
    1. population
    2. organization
    3. administration
    4. regulation
    5. protection
    6. finance

4. production

    1. business
    2. cultivation
    3. construction
    4. manufacturing
    5. transportation
    6. power

3.1. fields of activity, field pattern





3.1. fields of activity

3.1.1 intelligence

1. exploration

   (imagining, searching, discovering, isolating, defining, etc.)

2. comprehension

   (contemplating, comparing, analyzing, evaluating, believing, doubting, etc.)

3. information

   (data-collecting, data-storing, data-disseminating, etc.)

4. communication

   (speaking, writing, telephoning, broadcasting, televising, etc.)

5. expression

   (interpreting, transforming, composing, painting, sculpturing, singing, dancing, etc.)

6. education

   (teaching, propagandizing, learning, etc.)

3.1. fields of activity

3.1.2 welfare

1. recreation

   (playing, traveling, entertaining, loafing, etc.)

2. health

   (doctoring, restoring, maintaining, etc.)

3. sanitation

   (waste-disposing, sterilizing, etc.)

4. nutrition

   (food-preparing, food-serving, dining, etc.)

5. clothing

   (tailoring, dressing, adorning, etc.)

6. housing

   (home-making, sleeping, resting, etc.)

3.1. fields of activity

3.1.3 control

1. population

(family-forming, birth-planning, migrating, etc.)

2. organization

(congregating, incorporating, nationalizing, etc.)

3. administration

(governing, directing, planning, managing, etc.)

4. regulation

(law-making, law-interpreting, law-enforcing, etc.)

5. protection

(life-protecting, property-protecting, defending, etc.)

6. finance

(banking, investing, insuring, crediting, etc.)

3.1. fields of activity

3.1.4 production

1. business (exchange)

(stocking, displaying, selling, buying, etc.)

2. cultivation

(tree-growing, plant-growing, farming, animal-breeding, fishing, etc.)

3. construction

(excavating, hoisting, mixing, pouring, cutting, erecting, fastening, welding, installing, demounting, etc.)

4. manufacturing

(extracting, processing, machining, assembling, finishing, packaging, scrapping, etc.)

5. transportation

(conveying, shipping, piping, etc.)

6. power

(energy-transforming, energy-transmitting, energy-using, etc.)

3. culture

3.2. concepts (classify by fields so far as possible)

1. observations and perceptions

2. theories and hypotheses

3. principles, laws, standards

4. arts, sciences, disciplines

   (music, physics, engineering, sociology, etc.)

5. ideologies

   (religions, philosophies)

3. culture

3.3. organizations (classify by fields so far as possible)

1. family units

2. income groups

3. skills and occupations

   (explorers, scientists, artists, educators, doctors, administrators, soldiers, bankers, salesmen, architects, engineers, farmers, mechanics, etc.)

4. service groups

   (industries, companies, corporations, cooperatives, unions, professional societies, fraternal organizations, public departments, armies, government agencies, etc.)

5. social and political groups

   (tribes, states, nations, world federations, etc.)

II 3. culture

3.4. things (classify by fields so far as possible)

1. symbols

   (gestures, signs, pictographs, words, languages, artforms, etc.)

2. tools and instruments

   (books, toys, typewriters, clothing, furniture, containers, machines, implements, controls, servomechanisms, etc.)

3. materials

   (ores, seeds, wood, textiles, chemicals, metals, alloys, fuels, drugs, foods, etc.)

4. systems and parts

   (structural, mechanical, electrical, etc.)

5. structures

   1. space units
   2. buildings
   3. transports
   4. works
   5. areas
   6. centers

6. communities

   (villages, towns, cities, suburbs, etc.)

7. networks

   (power, transportation, communication, urban, etc.)

3.4. things

3.4.5 structures (classify by fields so far as possible)

1. space units

(classrooms, playrooms, living rooms, kitchens, cabins,
roomettes, washrooms, solariums, offices, storage vaults,
toolrooms, loading platforms, terraces, swimming pools, telephone booths, etc.)

2. buildings

(observatories, churches, libraries, schools, theaters, restaurants,
hospitals, houses, hotels, town halls, banks, office buildings, stores, factories,
barns, stables, hangars, broadcasting stations, etc.)

3. transports

(bicycles, elevators, automobiles, trailers, trains, ships, submarines,
airplanes, space ships, etc.)

4. works

(bridges, dams, docks, roads, fortifications, etc.)

5. areas

(gardens, parks, bird sanctuaries, sports fields, beaches, etc.)

6. centers

(civic centers, shopping centers, army posts, housing projects, universities, farms,
fisheries, industrial plants, power plants, airports, etc.)

3.4.5 structures

3.4.5.2 buildings (classified by fields)

1.1 exploration
(observatories, laboratories, etc.)

1.2 comprehension
(churches, meditation buildings, etc.)

1.3 information
(libraries, exposition buildings, etc.)

1.4 communication
(post offices, TV stations, etc.)

1.5 expression
(studios, concert halls, etc.)

1.6 education
(schools, planetariums, etc.)

2.1 recreation
(movie theaters, dance halls, etc.)

2.2 health
(gymnasiums, hospitals, etc.)

2.3 sanitation
(laundries, comfort stations, etc.)

2.4 nutrition
(restaurants, cafeterias, etc.)

2.5 clothing

2.6 housing
(houses, dormitories, hotels, etc.)

3.1 population

3.2 organization
(union halls, convention halls, etc.)

3.3 administration
(city halls, office buildings, etc.)

3.4 regulation
(capitols, courthouses, etc.)

3.5 protection
(warehouses, fire stations, etc.)

3.6 finance
(banks)

4.1 business
(department stores, etc.)

4.2 cultivation
(greenhouses, hatcheries, etc.)

4.3 construction

4.4 manufacturing
(dairies, refineries, factories, etc.)

4.5 transportation
(service stations, hangars, etc.)

development index

energy
elements
radiation
particles

universe
galaxies
solar system
earth

animates
cell components
monocells
plants
animals

forces
space-time
gravitation
life

cosmos

culture

fields
intelligence
welfare
control
production

concepts
observations
theories
standards
ideologies

organizations
family units
income groups
occupations
service groups
social groups

things
tools
materials
equipment
structures

man

species
races
families
individuals

entity
mind
body
growth
attitudes
behavior

index use III

It must be emphasized that the development index,
as set forth on the preceding pages,
is an attempt to identify and organize into operational unity
all the factors which should be considered
in the development of forms and patterns
that will further man's own growth and development.

Significant development relationships can be readily found
by checking pertinent connections or cross-ties
between the various factors.
In this sense the index becomes a master switchboard
for defining the range of information
needed in solving any specific development problem.

Such use of the index involves:

a. information flow

b. research questionnaires

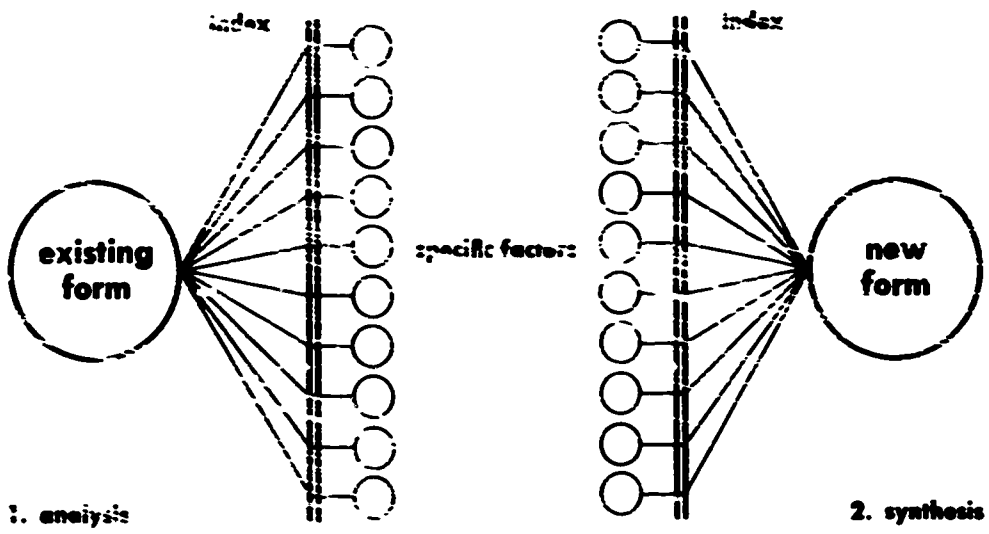
c. servicing of information

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.



III b. research questionnaires

The development index is primarily a tool of research —
a means for discovering new development relationships
as well as a means for sorting and selecting
the data coming from research and development
in various fields of activity.
As a basic pattern for the organization of knowledge,
it can serve to call attention
to the interrelationships between different fields
and thus to facilitate
the cross-pollination and fertilization of knowledge in general.

In order to promote advances of this sort,
appropriate research questionnaires are needed to indicate
a desirable direction and scope of development.
Such questionnaires can be designed
to bring out precise development requirements.
They presuppose a flow of information
based on the use of the development index.

The following pages present two research questionnaires:
(1) a suggested outline for the discovery and analysis
of dwelling needs
and for the development of new dwellings in any community;
(2) a suggested outline for the discovery and analysis
of community needs
and for the development of new communities
in any region or country.

III b. research questionnaires

1. questionnaire on dwellings

(1) dwelling inventory

(2) dwelling evaluation

(3) dwelling development

b.1. questionnaire on dwellings

1. dwelling inventory

(1) What dwelling types have already been developed?

Check various types in field of housing (3.4.5.2.2.6) – houses, apartments, hotels, motels, etc.

(2) By whom are these dwellings occupied?

Check various types of occupancy (3.3) – family size, income, occupations, etc.

(3) By whom are these dwellings owned?

Check various organizations (3.3) with particular reference to activities in field of finance (3.1.3.6).

(4) What activities are provided for in each dwelling?

Check activities in various fields (particularly 3.1.2) – home-making, resting, sleeping, dressing, food-preparing, etc.

(5) What are the specific provisions for such activities within each dwelling?

Check various space units (3.4.5.1) – living rooms, bedrooms, bathrooms, kitchens, etc.

Check various parts and systems (3.4.4) – structural systems, power supply, water supply, heating, lighting, etc.

(6) What are the functional and spatial relationships (a) within each dwelling and (b) between each dwelling and other structures within the community?

Check various community structures (3.4.5) – buildings, transports, works, centers, networks, etc.

2. dwelling evaluation

(1) What events are affecting the field of housing?

Check significant trends and developments in the various fields of activity (3.1) –

extension of television networks (communication)
increasing interest in leisure-time hobbies (recreation)
increasing importance of mental health (health)
introduction of pre-cooked foods (nutrition)
increasing human life span (population)
dispersal of communities for defense (protection)
development of automatic controls (manufacturing)
use of nuclear energy for domestic power and heat (power)

(2) In view of the trends indicated by these events, what specific activities should be provided for in new dwellings?

Check activities in various fields (particularly 3.1.2 and 3.1.1).

(3) What are the most desirable environmental relationships for these activities?

Check each activity for significant cross-ties to various factors listed –

a. Under cosmos (particularly 1.2.3 and 1.3.4) – light, sound, atmosphere, climate, etc.

b. Under man (particularly 2.2) – mind, body systems, growth, attitudes, behavior.

c. Under culture (particularly 3.2) – standards, ideologies.

(4) How well do existing dwellings meet these criteria of development?

Compare and evaluate.

b.1. questionnaire on dwellings

3. dwelling development

(1) What new dwelling forms are needed?

Use creative imagination and judgment.

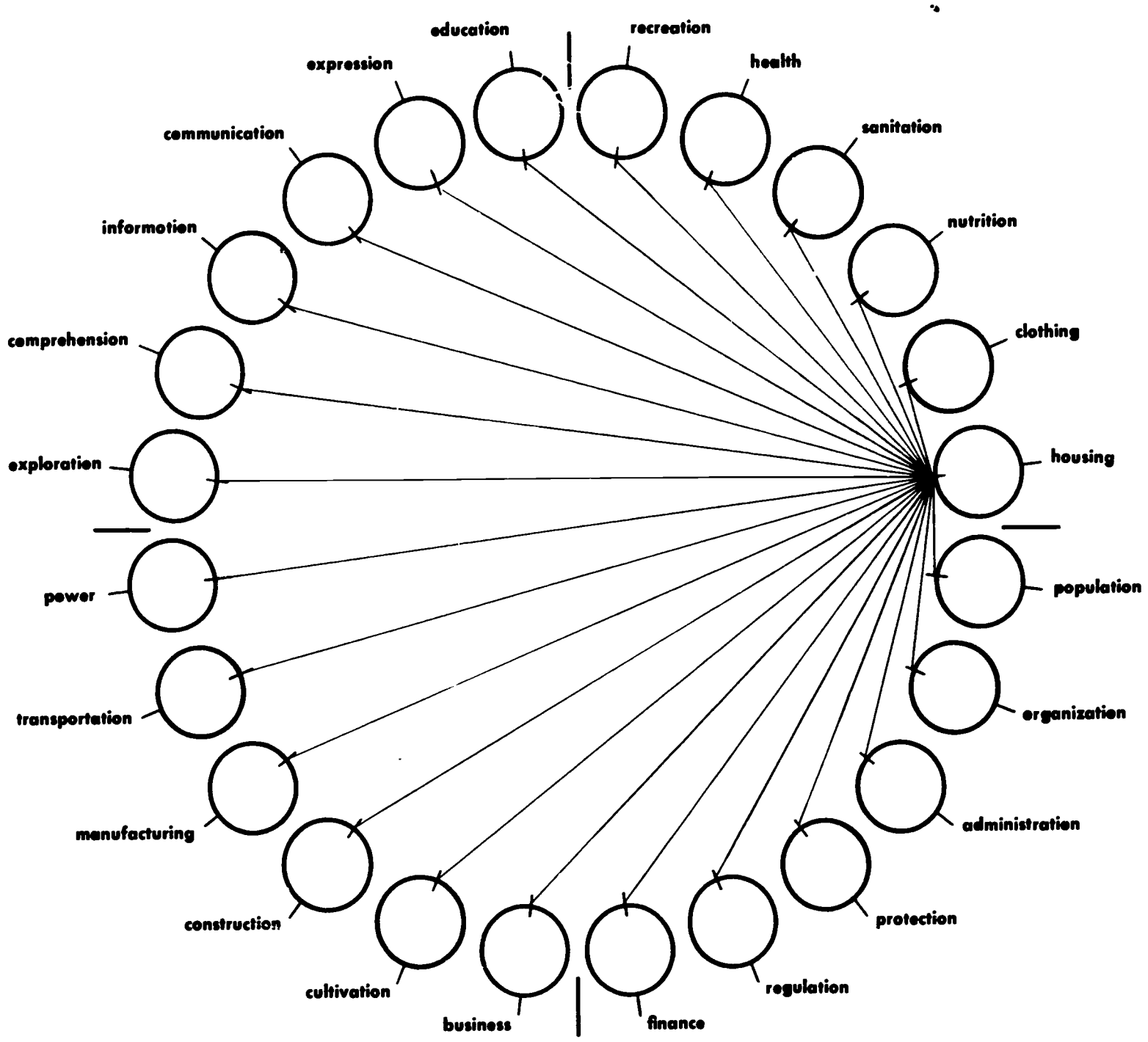
(2) What means are available for their development?

Check various concepts (3.2), organizations (3.3), and things (3.4).

(3) What is the desirable rate of development?

Check conditions prevailing in each phase of the development cycle.

dwelling relationships



III b. research questionnaires

2. questionnaire on communities

(1) community inventory

(2) community evaluation

(3) community development

b.2. questionnaire on communities

1. community inventory

(1) What is the specific community?

Classify under communities (3.4.6) according to function, location and size – manufacturing towns, recreational towns, residential suburbs, metropolitan areas, etc.

(2) What activities are carried on within the community?

Check the various fields for specific activities (3.1).

(3) By what individuals or groups are these activities performed or controlled?

Check various organizations (3.3).

(4) What facilities (things) are involved?

Check various local networks (3.4.7), centers (3.4.5.6), works (3.4.5.4), transports (3.4.5.3), and buildings (3.4.5.2).

(5) What are the functional and spatial relationships (a) within the specific community and (b) between this community and other communities within specific regional, continental or worldwide networks?

Define existing community patterns by checking the interactions of various factors determined above.

(6) What events have affected the development of the community in the past?

Check the various fields of activity (3.1) for significant trends which have brought specific community activities into existence.

b.2. questionnaire on communities

2. community evaluation

(1) What events are affecting standards of community development?

Check significant trends and developments in the various fields of activity (3.1) –

concept of one world (comprehension)
principle of mutual aid as a natural law (comprehension)
instantaneous global intercommunication (communication)
use of labor-saving electronic controls (manufacturing)
decentralization of industries (manufacturing)
use of light-weight structural materials (construction)
extension of mechanical mobility into the air (transportation)
expanding use of nuclear energy (power)

(2) What new standards of community development are suggested in the light of these events?

Check concepts (3.2.2) with reference to communities (3.4.6) and networks (3.4.7) –

increasing specialization of towns and cities
increasing specialization and expansion of community activities
formation of specific activity centers
increasing integration into urban networks
flexibility of forms to permit continuous change

(3) In view of these standards, what specific activities should be provided for in the community?

Check activities in various fields (3.1).

(4) How well do the existing community forms and patterns meet these criteria of development?

Compare and evaluate.

b.2. questionnaire on communities

3. community development

(1) What new community forms — local networks, centers, works, transports and buildings — are needed?

Use creative imagination and judgment.

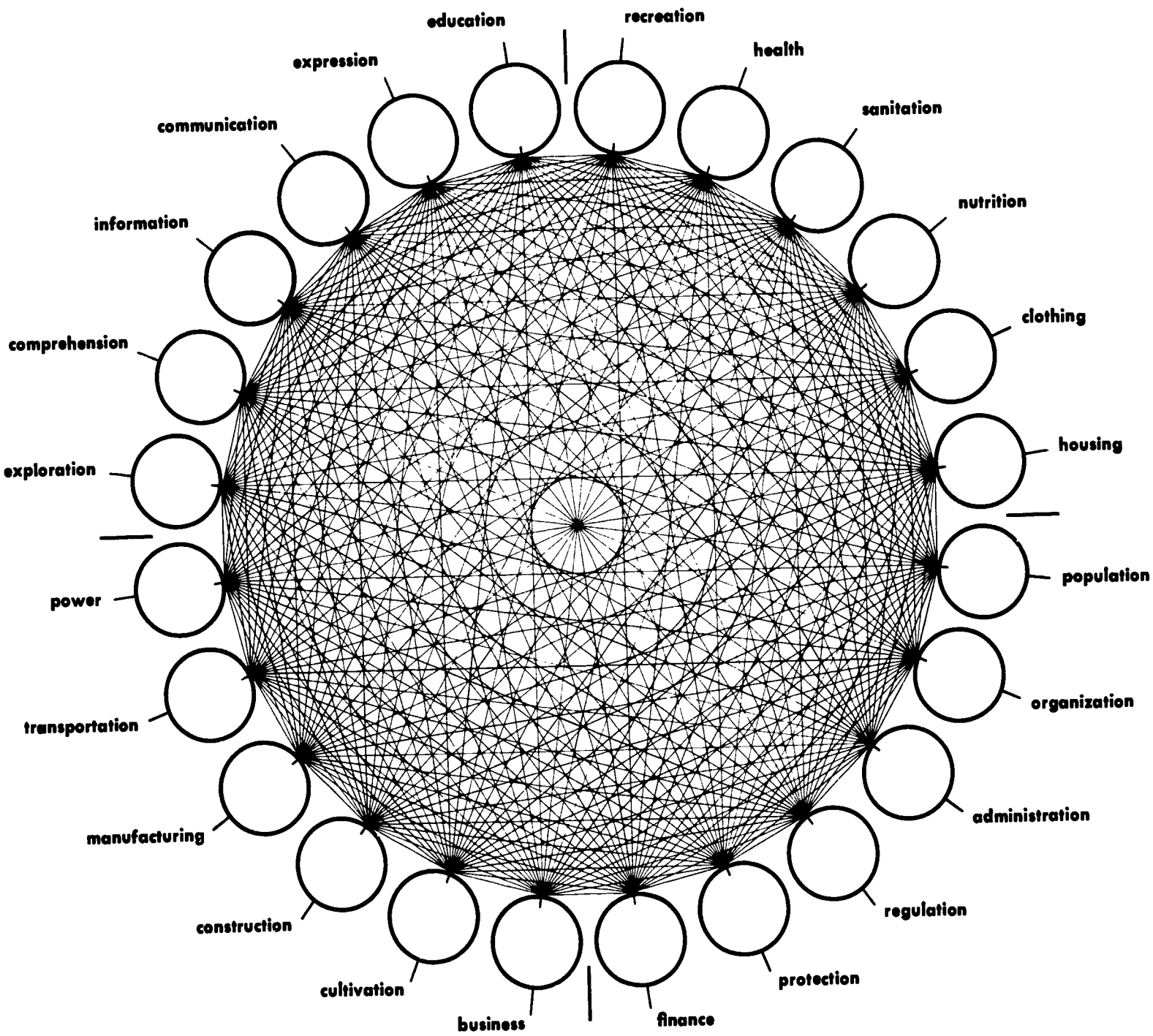
(2) What means are available for their development?

Check various concepts (3.2), organizations (3.3), and things (3.4).

(3) What is the desirable rate of development?

Check conditions prevailing in each phase of the development cycle.

community relationships



III c. servicing of information

A central Development Information Service is needed
for effective collection and dissemination of development data.
This organization could be made up
of numerous decentralized units,
all bound together into an operational unity
through their common use of the development index.
Individual units, such as a Building Information Center,
would have individual responsibilities,
but all would share in a general interchange of data.

It is apparent that the flow of information
would be speeded up considerably if it could be mechanized.
Automatic recorders and card-sorting machines,
microfilms, microprints, electronic controls
and other new devices should be utilized to the utmost
to simplify the task of documentation.
By using such devices,
it would be entirely practical to make frequent changes
in the form of the development index itself.
The coding and indexing of documents
would be governed by the particular edition of the index
current at the time of their publication,
and the sorting machines would be set accordingly.
There would be no need
to revise any coding or indexing previously done.

The first major concern of the Development Information Service
should be the amplification and refinement
of the development index.
Practical application will quickly reveal
any shortcomings the index may have
and thus provide a working basis for its further development.
Like any creative instrument,
the index will require skill and discretion in its use.
It is not an automatic mechanism.
Good judgment will be needed to screen the flow of information,
and new development relationships will be discovered
only by exercising a high degree of imagination.
These are qualities the Development Information Service
will have to seek in furthering its own development.

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