Appendix B

B.1. Parallel Cycles in Detail

This appendix contains a detailed parallel cycles model with explanation. It was my intention to spare the reader unnecessary difficulty in reading the paper, for which the simpler model is completely adequate. It was my feeling, however, that some readers might wish to examine the diagram in greater detail. There are many additional lessons about information that can be learned by close examination. The great challenge of this diagram was to assure that it was adequate for each of the many types of cultural construction. Its application to manufacturing is (relatively) simple and straightforward. It was my intention that it should also represent all of the information scales that I have proposed elsewhere (Abel, 2014, 2023a). This is a good test of the model, at which it succeeds, albeit with some additional explanation. The fact that the model does succeed is evidence that it is capturing the shared nature of all forms of cultural production and maintenance.

Figure 9 is an expansion of Figure 3 and Figure 8. This figure is drawn at a level of complexity that is equivalent with Figure 2. Recall once more that this diagram includes two instances of the information cycle step numbers, 1,1a,2,3,4,5. The execution of this redesign is straightforward, though admittedly the appearance may be intimidating, and explanation is needed. Subsystems a, b, and c are nearly identical to subsystems in Figure 2 (a, b, and c). Their function, however, is not the production of organisms (in seeds, eggs, spores, or offspring), but is the construction of manufactured objects (e.g., cars, smartphones) or communication objects (e.g., plays, lectures, songs, TV shows, books, etc) in the process ‘Construct Performances’ in subsystem (c), which results in ‘performances’ of some kind (including those that produce manufactured objects). It can be seen in subsystem (c) that the storage labeled ‘Performances’ is the product of the ‘Construct Performances’ (step 4b), an *interaction* of three flows, the ‘Template Copies’ (script, blueprint, manuscript, design specs, etc) and ‘Communicators’ (actors, teachers, researchers, engineers) flowing up from subsystem (b), together with ‘Expression Mechanisms’ (factories, theaters, printing presses, universities, offices, labs, etc.) that flowed down from subsystem (e) and, third, the ‘*Use* Energy’ to power the mechanisms, plus one more feedback flow from the Performers in the Performance. The ‘Expression Mechanisms’ are constructed in subsystem (e) with its own ‘Construct Energy’ and ‘Materials’ inputs. The ‘Construct or Repair’ process of the subsystem is an interaction of energy, ‘Support Workers’ (industry laborers, stagehands, ticket takers, etc) and control information in the forms of ‘Operating Procedures, Standards, Conventions and Communicators’ (directors, managers, deans etc) that flow up from subprocess (d). The products are expression mechanisms, i.e., functioning ‘Facilities’ (again, the factories, theaters, etc) that are ‘dispersed’ (metaphorically) to subsystem (c) for the production of performances. The resulting performances (news stories, plays, lectures, songs, loans, laws, or widgets, etc) are then duplicated (4b) and ‘Dispersed’ (5) (‘copied’, ‘broadcast’) to the intended ‘Recipients’ (audience, FB friends, buyers, etc) as the information objects flow out of subsystem (c) into subsystem (a).

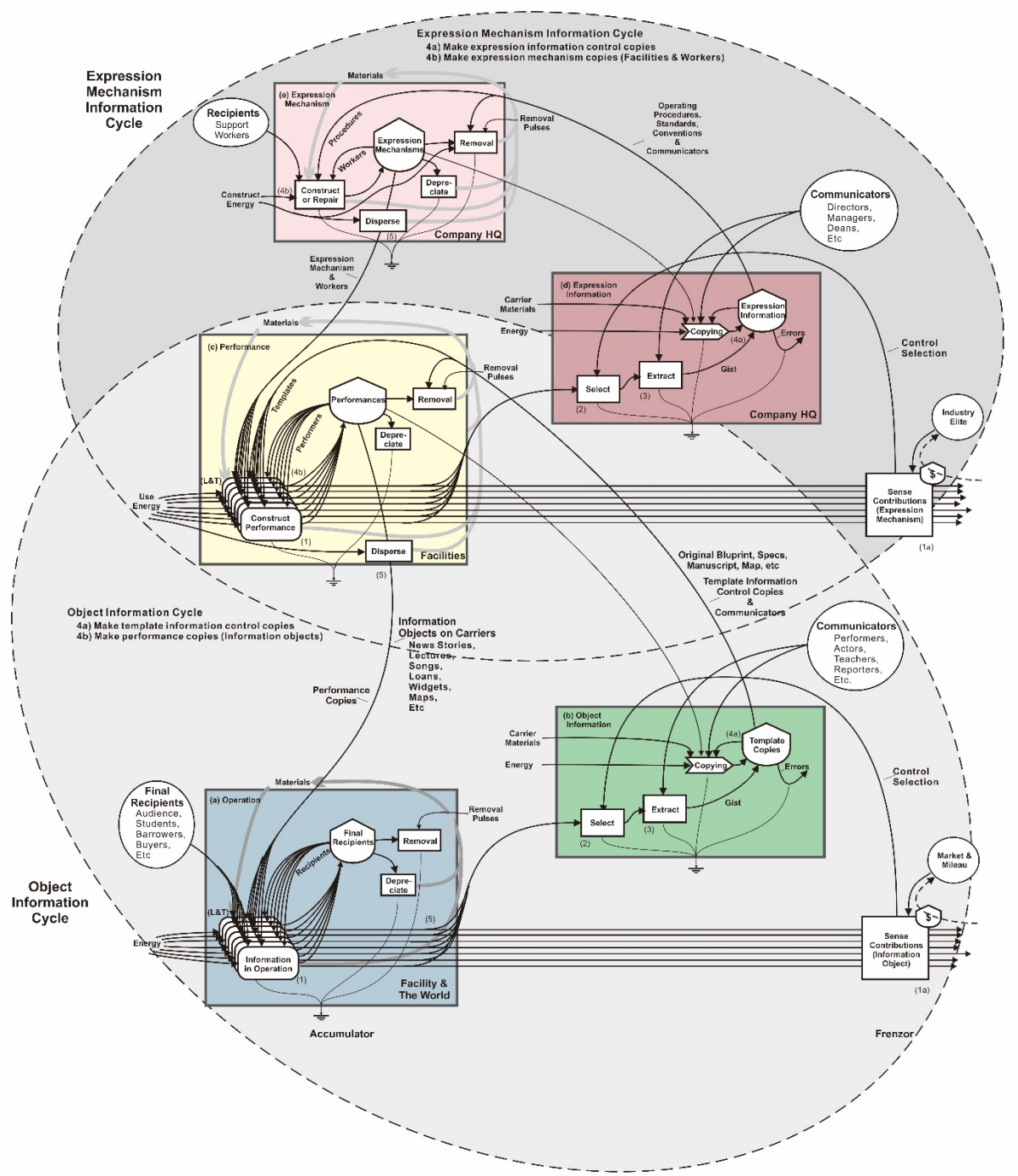

Figure 1. Parallel Cycles in Detail. The resolution of this large diagram is low, and I have therefore produced two additional diagrams for the two information cycles, Figure 10 for the Object Information Cycle, and Figure 11 for the Expression Mechanism Information Cycle.

B.2. Object Information Cycle

Looking more carefully at the Object Information Cycle (Figure 10), some specific issues can be raised. Regarding subsystem (b), in a parallel cycles model of *manufacturing*, this process is relatively straightforward. A well-functioning object is 'selected', its design is 'extracted', and with the addition of energy and the intellectual input from engineers, 'copies' of specification documents are produced to control the process of manufacturing (flowing up from subsystem (b)).

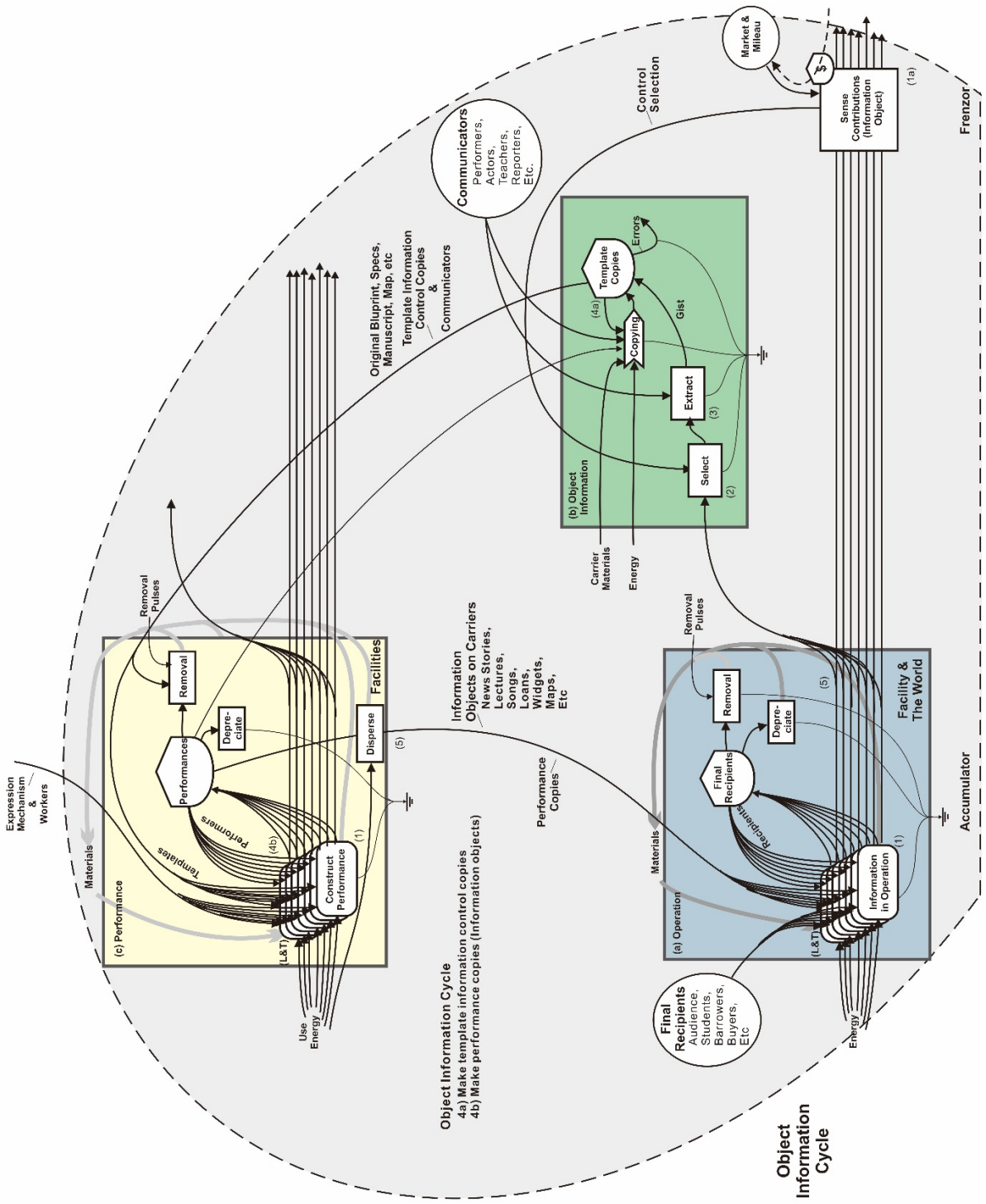

Figure 2. Object Information Cycle. This is a higher resolution duplication of the bottom half of Figure 9.

In the parallel cycles model of a type of cultural information, for example, academic research, this process is more complex. 'Selected' by the researcher and 'extracted' from the world are the information in fieldwork, labwork, literature review, etc. From published literature, the *full* content is *not* extracted, but

valuable pieces or 'gists' are extracted and incorporated into the construction of the original draft of a manuscript (Abel, 2014). That building process is perhaps well-represented by the autocatalytic relationship between the interaction symbol and storage, by which gists of information and empirical data are assembled piecemeal to the manuscript 'storage' in subsystem (b), which as it builds its structure, feeds-back to draw in more until a draft is complete. While this more complex interpretation may not have been Odum's original intention for this interaction, it fits well with the activity of academic writing.

Recall that 4a and 4b are *together* the steps for writing and publishing academic scholarship. Notice that the draft manuscript then moves to subsystem (c) Performance. This is intended to be the location of the final manuscript production and duplication. To be perfectly accurate, the activities of producing the draft in 4a, are also located in the expression mechanism 'facility' of 4b. Placing the draft production in subsystem (b), allows the model to align with its use in manufacturing as the location for the production of 'design specs'. It also allows for the clear separation of the production of the first 'original' manuscript, and the production of manuscript 'copies', which is an important distinction for Odum. For the Texas highway study, it allows for the separation of production of the map original and the map copies (Figure 8).

Another issue is the addition of the Final Recipients storage to subsystem (a). In Figure 1, for the case of biological reproduction, the organisms output from the 'Make Copies' Step 4, are simply 'Dispersed' (Step 5) to the world where they live their lives, 'Operate Systems', or in the terminology of Figure 2, they are 'Information in Operation'. In Figure 9, subsystem (a), a 'storage' of 'Final Recipients' was added to make explicit that information objects or manufactured objects must reach their final 'Recipients'. This storage and its feedback 'interaction' was added in part to emphasize that cultural objects are always 'learned/experienced' by recipients. The 'Information in Operation' process in subsystem (a) (and also the 'Construct or Repair' process in subsystem (e), and the 'Construct Performances' process in subsystem (c)) is a 'learning and teaching' (L&T) interaction (Odum, 1996, pp. 230-231), which must be highlighted. Reproductive biology has no need for this step; the seed, egg, spore, or offspring are simply 'dispersed' to the world, where they live their lives. In the case of human information, the added interaction with *learners* is always required. And despite the many 'intermediate carriers' in the process, the final *carrier* of information that reaches recipients is always the person, with their energy of metabolism. This diagram thus requires a more complex dispersal of the information object, first from the 'performance', and then to the persons who have experienced or received the object of that performance.

B.3. Expression Mechanism Information Cycle

Looking more closely at the upper half of the redesigned diagram (Figure 11), labeled the Expression Mechanism Information Cycle, there are two additional subsystems, (e) Expression Mechanism, and (d) Expression Information. Together with subsystem (c), these three subsystems compose a second, parallel, information cycle. It is again a 'structural life cycle' design like Figure 2 with a storage that represents the physicality of an object, not only the information required for its production. The object that is produced is the 'Expression Mechanism', shown as a storage. Examples of an expression mechanism are a studio, office, stadium, theater, university, etc, each for the production of information objects (a news broadcast, a lecture, a ritual, or an academic book), or likewise a factory for the production of manufactured goods. The expression mechanism also includes the industry support workers (the Recipients inflow) that use the 'Expression Information' (in the form of 'Operating Procedures, Standards, and Industry Conventions') in the preparation of the expression mechanism. The interaction between the workers and the procedures is another learning and teaching (L&T) interaction in the 'Construct or Repair' process in subsystem (e), and it requires its own energy supplies ('Construct Energy'). Once assembled, various studios (offices, factories, etc) are 'Dispersed' (metaphorically, they are typically built at locations other than the Company headquarters) and put into action for the construction of the 'Performances' in subsystem (c), discussed above.

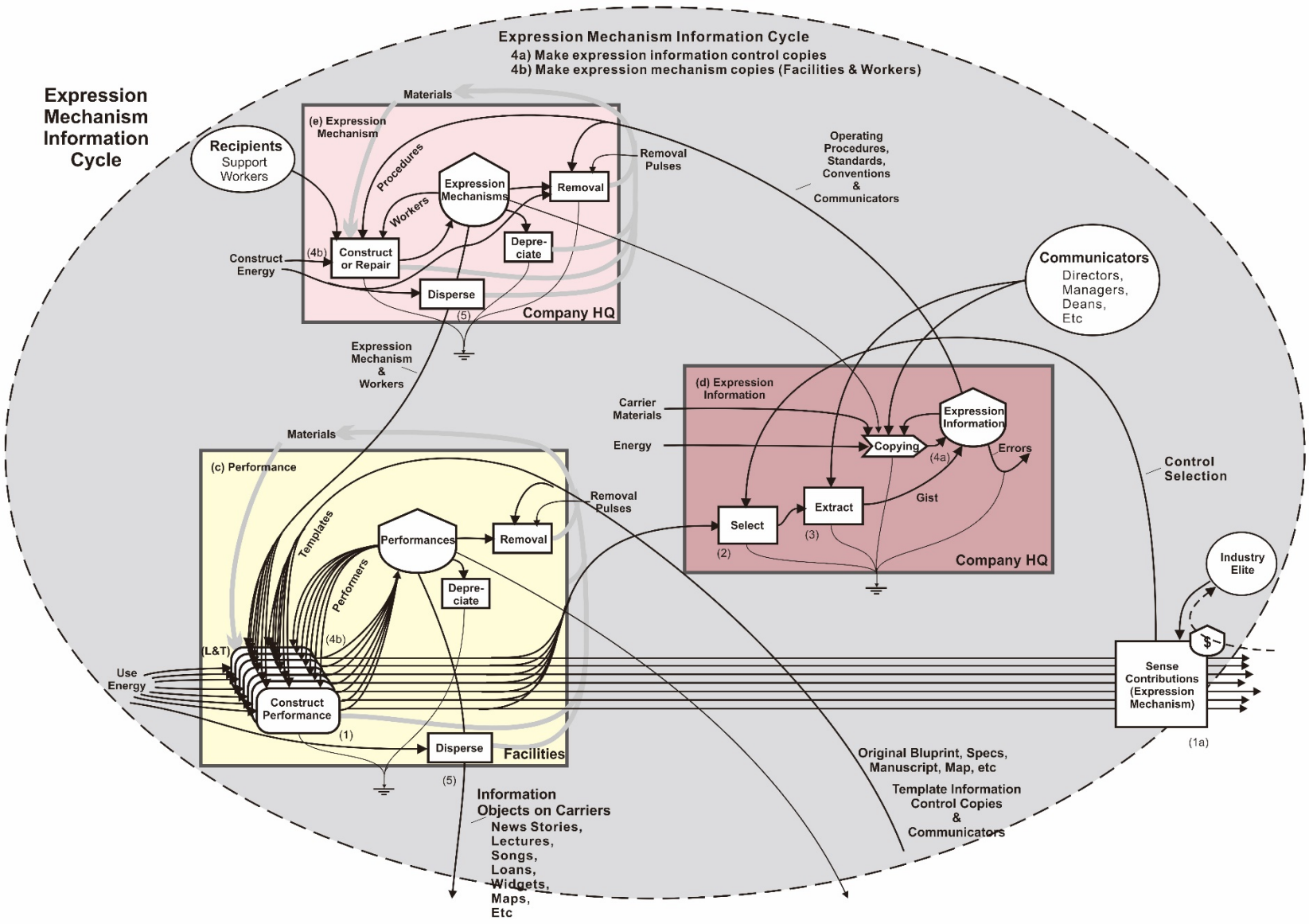
Expression Mechanism Information Cycle
4a) Make expression information control copies
4b) Make expression mechanism copies (Facilities & Workers)
Expression Mechanism Information Cycle
Recipients
Support Workers
Materials
(e) Expression Mechanism
Procedures
Workers
Expression Mechanisms
Removal
Removal Pulses
Depre-ciate
Construct or Repair
(4b)
Construct Energy
Disperse
(5)
Company HQ
Operating Procedures, Standards, Conventions & Communicators
Communicators
Directors, Managers, Deans, Etc
Expression Mechanism & Workers
(d) Expression Information
Carrier Materials
Energy
Copying
(4a)
Expression Information
Errors
Gist
Extract
Select
(2)
(3)
Company HQ
Control Selection
Materials
(c) Performance
Templates
Performers
Performances
Removal
Removal Pulses
Depre-ciate
(4b)
(L&T)
Use Energy
Construct Performance
(1)
Disperse
(5)
Facilities
Industry Elite
$
Sense Contributions (Expression Mechanism)
(1a)
Original Bluprint, Specs, Manuscript, Map, etc
Template Information Control Copies & Communicators
Information Objects on Carriers
News Stories, Lectures, Songs, Loans, Widgets, Maps, Etc

Figure 3. Expression Mechanism Information Cycle. This is a higher resolution duplication of the top half of Figure 9.

The 'Expression Information' of procedures, standards, and conventions, just like the information objects must be *maintained* against loss or depreciation, again in an information cycle. That information is extremely valuable, and if it were lost it would require much work to reproduce it. Just as the larger scale of the Object Information Cycle (lower half), that is, the 'Market and Milieu', 'Senses the Contribution' (1a) and 'Selects' (2) the 'Information Object' to be produced again, so too the larger-scale of the Expression Mechanism Information Cycle (top half) guided by 'Industry Elite' also 'Senses the Contribution' (1a) and 'Selects' (2) successful 'Expression Information' to be reproduced and applied again, i.e., the facilities (factories, studios, stadiums) that work the best are 'copied' around the industry. The essence of the 'Information Object' is extracted and copied in subsystem (b). But the Expression Mechanism also requires the selection and cycling of successful 'Expression Information', which occurs in subsystem (d). The information cycle (d) maintains the Expression Information that guides the Expression Mechanism process. This is the parallel information cycle (the 'Expression Mechanism Information Cycle') that is always required 'behind the scenes' for the production and maintenance of cultural information and manufactured objects.