# The Hard Facts of Soft Social Systems: Towards a Theoretical and Practical Model for Schools and Other Organizations

**Susan Farr Gabriele**
GEMS • Gabriele Educational Materials & Systems, sgabriele@gemslearning.com
Chapman University, Manhattan Beach, California, gabriele@chapman.edu

## Abstract

In this essay, three hard facts of soft social systems are identified, intended to inform instructional designers and designers of organizational change efforts. The facts are gleaned out of an elaboration of Boulding's nine-level typology of system complexity. The need for these hard facts is great, given the failure of many well-intentioned reform efforts to positively impact schools and organizations.

In brief, the three facts are as follows. First, ***things are designable--mass, space, time, and organization goals*** (cf. Boulding's levels 1-3). Second, ***people are not designable.*** A person's behavior is determined by internally prescribed criteria (level 4: cell), generally predictable by Maslow's hierarchy of human needs, but increasingly variable with each individual/person/ system member (e.g., employee, student, teacher, parent) because people differ (level 5: plant, genetic variety). They act according to their own immediate perceptions (level 6: animal, sensory perceptors), and their own long term reflections and choices (level 7: human, symbol processing). The third fact is: It is natural, biological, and scientific law that ***people will behave to meet their individual and personal needs before their social system or organization's needs*** (levels 8 and 9). Level 8 systems (social) are optional; level 7 functioning is mandatory. A person can transfer schools (level 8), but cannot transfer bodies (level 7).

Implications are that effective instructional and organization designers put all their attention to the designable components of a social system: ***space*** (e.g., buildings, rooms, book shelves, books and equipment), ***time*** (e.g., school and classroom routines, schedules and calendars), ***school*** and ***classroom goals*** (e.g., classroom projects, school mission statements, etc.); and ***ratios*** and ***flows*** of resources. Effective designers fashion these designable components as attractors, to attract system members. These attractors function to allow system members to meet individual/personal goals as first priority, and organization goals as second priority. Contribution to systemic change theory is a new systemic approach, referred to and named here as ***systemic renewal.*** Systemic renewal is defined here as systemic change efforts with goals of facilitating each system member to learn and grow at his or her own pace. The ISSS Morning RoundTable is a practice that corresponds to the goals of systemic renewal.

*Keywords:* organizational change theory, systemic school change, systemic renewal

# Introduction

In spite of certain progress in equity and technology in modern public education, our public schools and institutions are in decline-- a decline that is sometimes accelerated, rather than arrested, by well-intentioned reform efforts. Our school decision makers and stakeholders do not agree with, or do not understand, each others' solutions. Some are stumped and (perhaps most wisely) offer no solutions. Others propose conflicting or counterproductive solutions.

Science offers useful laws and principles for how "things" behave, or the "hard" sciences, such as chemistry, physics, and math. For example, we know how to make water of one part hydrogen and two parts oxygen. We know about the laws of gravity. We know that two and two make four.

Science offers conflicting principles and models for how "people" behave--in the "soft" sciences such as psychology, management, education, and sociology; as well as in "soft" social systems such as schools and workplaces. On one end of a continuum, there are old paradigm directive, bureaucratic, and top down models, which assume a soft system is predictable and controllable. On the other end, there are new paradigm cooperative, laissez-faire, and bottom up models which assume social systems are unpredictable and uncontrollable.

With these conflicting approaches, it is no wonder that current change efforts do not help our schools. A better understanding of the inner workings of schools, workplaces, and other social systems is needed. In other words, we need to know the hard facts of soft social systems. Moreover, "we" means scientists, politicians, educators, employees, managers, parents, everyone. The hard facts need to be clear and evident to every decision maker and stakeholder in schools and workplaces.

# Method

To clarify the hard facts of soft systems, Kenneth Boulding's typology of system complexity is presented and elaborated. The model is then linked to existing organization theory. Then, three hard facts drawn from the elaborated model are presented and illustrated with practical examples from schools.

### Boulding's Typology

Boulding, a cofounder of general system theory and "systems" thinking, looked to nature to uncover the hard facts of soft social systems. He ranked the systems of the world from simple to complex in a nine level taxonomy. Boulding's typology (1956) has been described as "convincing" (Checkland, 1981, p. 106) and "illuminating" (Scott, 1992, p. 78). His nine levels are:

1- FRAMEWORKS: systems composed of static structures, such as the arrangements of atoms in a crystal of the anatomy of an animal.

2- CLOCKWORKS: simple dynamic systems with predetermined motions, such as the clock and the solar system.

3- THERMOSTATS: cybernetic systems capable of self-regulation in terms of some externally prescribed target or criterion, such as a thermostat.

4- OPEN-SYSTEMS: systems capable of self-maintenance based on a throughput of resources from its environment, such as a living cell.

5- BLUE-PRINTED GROWTH SYSTEMS: systems that demonstrate divisions of labor, that reproduce not by duplication but by the production of seeds or eggs containing preprogrammed instructions for development, such as the acorn-oak system or the egg-chicken system.

6- INTERNAL-IMAGE SYSTEMS: systems capable of a detailed awareness of the environment through sense organs (eyes, ears, etc.). Information is received and organized into an image or knowledge structure of the environment as a whole, a level at which animals function. At this level the image or perception intervenes between the stimulus and response.

7- SYMBOL-PROCESSING SYSTEMS: systems that use language and other symbols, are self-conscious, and can contemplate the past, present, and future. Humans function at this level.

8- SOCIAL SYSTEMS: multicephalous systems comprising actors functioning at level 7 who share a common social order and culture. Social organizations operate at this level.

9- TRANSCENDENTAL SYSTEMS: systems composed of the "absolutes and the inescapable unknowables." (Boulding, 1956)

**Boulding's Typology Linked to Organization Theory and the Social Sciences**

Boulding's typology is clarifying to social science/organization theory (illustrated in Figure 1). Boulding notes that "most of the theoretical schemes of the social sciences are still at level 2 [clockworks], just now rising to level 3 [thermostat systems], although the subject matter clearly involves level 8 [social systems] (Scott, 1992, p. 78)."
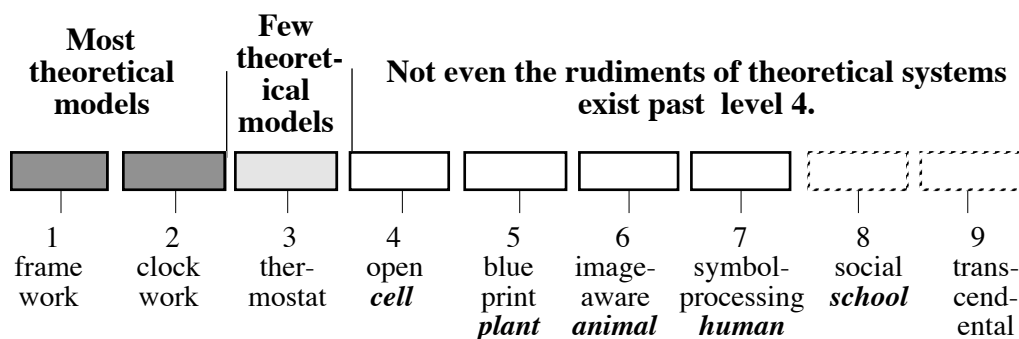
| Most theoretical models | | Few theoret-ical models | Not even the rudiments of theoretical systems exist past level 4. | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 frame work | 2 clock work | 3 ther-mostat | 4 open *cell* | 5 blue print *plant* | 6 image-aware *animal* | 7 symbol-processing *human* | 8 social *school* | 9 trans-cend-ental |

**Figure 1. Boulding's 9 Systems Levels Linked to Organization Theory**

Figure 1 also introduces coding to illustrate the increasing unpredictability of Boulding system levels. Levels 1 and 2 are dark gray boxes (designable, externally regulating to externally prescribed criteria). Level 3 is a light gray box (self-regulating to externally prescribed or designable criteria). Levels 4 -7 are clear boxes (undesignable, self-

regulating to internally prescribed criteria). Levels 8 -9, clear boxes with dotted-line boundaries, (undesignable and intangible).

Boulding's typology clarifies two overarching principles which unify the conflicting "either-or" perspectives of organization theory and clarify the weaknesses and strengths and of the top-down governing bureaucratic model. His typology clarifies both the inadequacy and suitability of the top-down governing bureaucratic model.

**The inadequacy of clockwork assumptions of old paradigm models.** The fundamental flaw of current old paradigm bureaucratic models lies in the assumption of predictability and stability or "clockwork" assumptions, and thus the lack of distinction between processes that Boulding calls clockwork (predictable) and nonclockwork (variable, intangible). Our current work and educational reform efforts are based on, or maintain traces of, these unexamined assumptions. For example, in the new paradigm term "cooperative learning," "cooperative" means operating jointly, but the more common meaning of cooperative is obedient (an old paradigm virtue).

**The suitability of clockwork assumptions**. While the clockwork assumptions underlying bureaucratic systems are known to be inadequate, Boulding remarks that "much valuable information and insights can be obtained by applying low-level systems [frameworks, clockworks] to high-level subject matter [humans, social, and transcendental systems]" (Scott, 1992, p. 78). The reason for this is that each of Boulding's system levels incorporates all those below it (illustrated in Figure 2).

Thus, proponents of decentralization and self-regulation who ignore the need for framework and clockwork subsystems are also short-sighted. The fully-specified new paradigm must subsume characteristics of the old; it must be joint-optimizing for both stability and flexibility. More specifically, Boulding's model distinguishes between subsystems of external and internal agency to explain what can be predicted or externally designed and controlled, and what is controlled by internal agency or criteria.
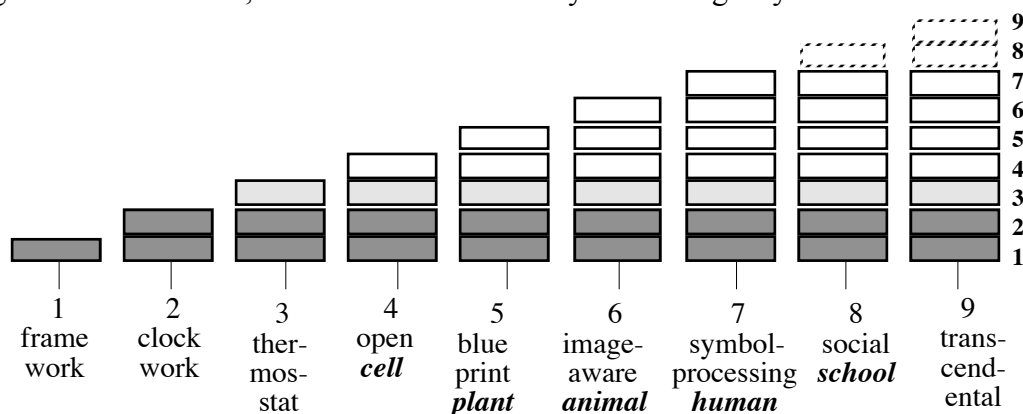


**Figure 2. A View of Boulding's Nine Systems with Their Levels of Complexity**

Boulding's explanation of the inadequacies and suitabilities of the top-down governing model is clarifying. The old question for organizational change theorists and practitioner

was: "Which is correct? top-down or laissez-faire?" It is shown to be incorrect. The new question is: "Which parts of an organization need top-down control, and which parts need bottom-up flexibility?"

To illustrate both Boulding's system types and the increasing complexity, Figure 3 puts Figure 1 and 2 side by side.  Figure 1 is usefully visualized as a top view of Boulding's nine system types.  Figure 2 as a front view.
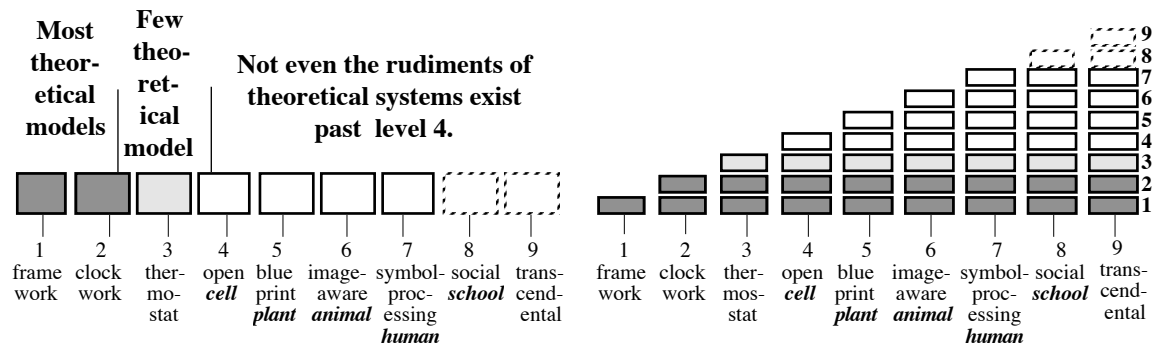


**Figure 1. Theory (also a Top View 9 Systems)**     **Figure 2.  A Front View 9 Systems**
**Figure 3. Two Views of 9 Systems of the World According to Boulding**


## A Summary Explanatory Model and Three Hard Facts of a Social System

It is commonly known that the more complex the system, the more multiplicity in agency, causes, or factors contributing to change.  However, the Boulding-elaborated model adds considerable clarification.  Briefly, illustrated in Figure 4, the designable elements of a social system are indicated with arrows, along the bottom right side of the figure.  The other dimensions are not designable, as behavior depends on the individual which is self-regulating and self-creating according to internally prescribed criteria. That is, individual needs and goals (center figure) influence, and are influenced by, individual variability, perceptions, choices.

In fact, Figure 4 allows us to identify three hard facts of soft systems, discussed next.
First, the model uncovers two different sites of agency: external (i.e., designable) vs. internal (i.e. where external design efforts are unfitting). The **external agents** that can be input into an organization, the factors of the first three levels, were identified by Checkland (1981) as spatial traits (i.e., length and mass), temporal traits (i.e., time), and information (i.e., images, ideals, words).  The identification of  the factors of agency at levels 4 and higher was unaccomplished (Checkland, 1981) until recently (Gabriele, 1997).
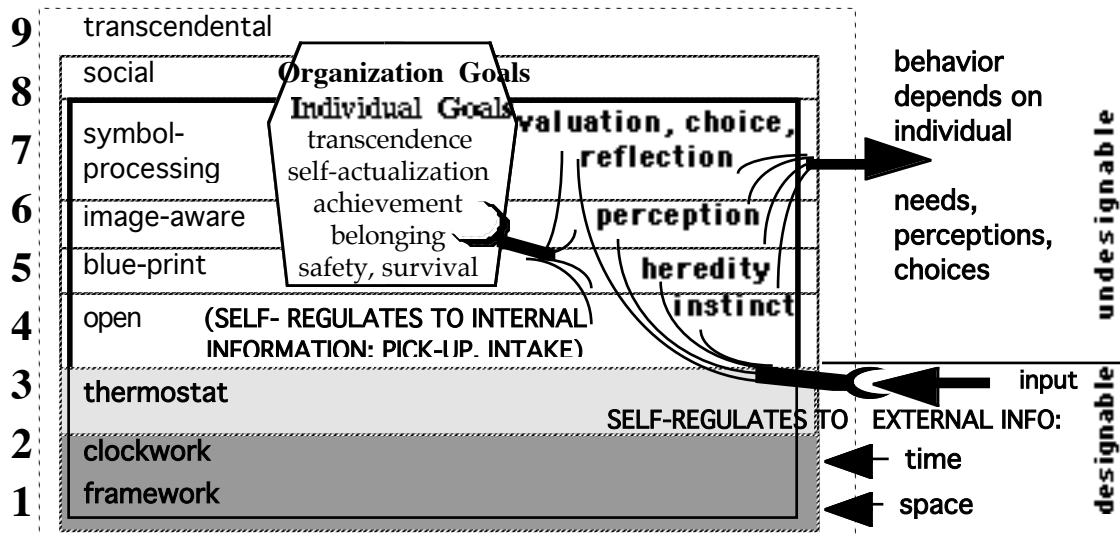
| | | |
|---|---|---|
| **9** | transcendental | |
| **8** | social | Organization Goals |
| **7** | symbol-processing | Individual Goals — evaluation, choice, reflection / transcendence |
| **6** | image-aware | self-actualization achievement / perception |
| **5** | blue-print | belonging safety, survival / heredity |
| **4** | open | (SELF- REGULATES TO INTERNAL INFORMATION: PICK-UP, INTAKE) instinct |
| **3** | thermostat | SELF-REGULATES TO EXTERNAL INFO: input |
| **2** | clockwork | time |
| **1** | framework | space |

behavior depends on individual

needs, perceptions, choices

undesignable

designable

**Figure 4. The Power and Agency Within a Social System**

• **Fact 1: THE DESIGNABLE COMPONENTS OF A SOCIAL SYSTEM ARE MASS/SPACE, TIME, GOALS, RATIOS, FLOWS. The only directly designable features of a social system are found in Boulding's first three levels: (use of) space (level 1), (use of) time (level 2), organization goals (cf. thermostat settings), ratios (cf. size of heater, room with relation to number of people, etc.) and flows (distribution of heat/resources).**

From the bottom in Figure 4, levels 1 and 2 represent the designable components: space and time. Level 3 illustrates that the thermostat setting (input) is externally designable, and the system is self regulating to that external criteria. (Black arrows indicate that these components are externally designable.)

• **Fact 2: COMPONENTS THAT DEPEND ON INDIVIDUAL BEHAVIOR MUST BE CREATED AS "ATTRACTORS." Components of a social system dependent on individual behavior, learning and creation are to be designed as attractors-- designed to maximize opportunities for all people to meet their own self-determined needs (level 4) variable from person to person (level 5) according to each person's own immediate perceptions (level 6) and each person's long term perceptions, goals, and choices (level 7).**

The Boulding-elaborated model explains the attributes of internal individual agency and motivation (or factors that influence individual behavior) component by component, or level by level, as systems increase in complexity (levels 4-7 in Figure 4). The 1997 Gabriele paper may be the first to aim to identify factors of agency at levels 4 and higher as internally located and prescribed, and to name the specific the new factor that emerges at each new higher level. Specifically, individual human behavior (which depends on internally prescribed criteria) is generally predictable as instinct or basic survival needs in response to the environment, (level 4: cell) followed (at least in humans) by needs for safety, belonging, achievement, self-actualization, and transcendence (Maslow in Valle,

1989). However, predictability decreases by individual human variability which may be inherent (level 5: genes); due to individual perceptions through the five senses, (level 6: images); and long term perceptions, reflections and choices due to the ability to read and reflect on symbols (words, numbers and more) over time (level 7: symbol processing). To avoid or minimize these principles is not unlike avoiding or minimizing the accepted laws of physics.

**• Fact 3: DESIGNABLE ATTRACTORS: DEFAULT SETTING = INDIVIDUAL GOALS: Level 7 or individual/personal goals are first priority. If level 8 organization goals are in conflict with individual goals, people will abandon (openly or covertly) the goals of the organization and use their energy for personal goals.**

The Boulding-explanatory model in Figure 4 clarifies that needs and goals of individual humans are primary and that the needs and goals of organizations are secondary. A level 7 system, an individual human (thick solid line boundary in Figure 4), is a natural, biological system with permanent physical boundaries. If level 7 needs are not met, death or illness occurs. A level 8 system, an organization (dotted-line boundary in Figure 4), is a designable, interchangeable system with impermanent, intangible boundaries. If social system needs are not met, the social system may fail, (divorce, business failures, etc.) but the individuals remain alive. If level 7 systems (people) find their level 8 needs (organization) are not being met, they can transfer to a new social system. Thus, it is natural that the individual human will strive to meet his/her basic needs before meeting organization needs. For example, in unhealthy organizations, rather than using their energy for the goals of the organization (a level 8 goal), people may use their energy towards personal goals (level 7 goals). The advantaged individuals will continue working towards personal promotions. The disadvantaged will work towards survival and safety; they will tell their supervisors what they want to hear, if their survival depends on it.

Regarding transcendence, Boulding's level 9, there are, of course, individuals whose personal needs are very small, whose work is transcendent in spite of the conditions they (choose to) live in. An excellent modern example is Mother Theresa. More mundane examples are the many educators and teachers who remain creative in classrooms and schools in spite of the increasing pressures in urban education. While it is admirable and predictable that humans can and do transcend their conditions, it is clearly not an argument for keeping conditions inadequate when awareness has been raised. In fact, McPherson illuminates the underlying principle here, claiming that "neither the few destructive laggards nor the handful of brilliant performers" are the key to organization health. Instead he urges attention to the "care, feeding, and unshackling of the average man" (Peters, 1982). The fact that humans can and do transcend their conditions is an argument for the value of design driven by ideals. In other words, "problem-solving" projects and teams should be revised to be "ideal-seeking."

# Boulding's Social System and Schools

**Classroom and Meeting Theory**

The identification of external vs. internal agency and designables vs. attractors also leads to a  better understanding of the instructional/learning processes that occur in classrooms and meetings.  There are two processes: that of the teacher or facilitator: DISPLAY or INPUT (arrows in figure 5); and the other is that of the learner:  PICKUP or INTAKE (pickup mechanisms in figure 5).  Thus, information cannot be installed (input), but is "picked up" by learners.  Arrows pointing left indicate what can be designed or controlled in an organization by an external agent (input).  Pickup mechanisms show which agency lies within the individual person.  Pickup depends on  (1) learner readiness: prior knowledge (Smith, 1983) and task difficulty (Neisser, 1976), (individual ability to process the symbols),  (2) learner perception from among competing stimuli (Neisser), (2) learner motivation (Maslow in Valle) from among competing goals. A third process, formerly considered response, is better conceptualized as CREATION (arrow pointing right in figure 5); as each individual learner will have a response or behavior unique to his/her needs, goals, perceptions, and choices.

Figure 5 shows five models of the instructional/learning process that have been clarified by Boulding's systems thinking and the concepts of display and pickup.  Figure 5A: The old paradigm assumed that knowledge was installed in students (or employees).  In fact, in the 1700's, schools had students memorize words and passages.  Figure 5B: The new paradigm is not fully specified, students are active participants in their learning, but the teacher's (or employer's) role is unclear.  Figure 5C: Boulding's "systems" model reveals that the teacher's role is display, the student's pickup.  Figure 5D: Effective teachers, facilitators, and managers will provide a rich display to increase opportunities for pickup.  They will also provide opportunities for creative response and creation.  Figure 5E: Moreover, teachers are learners too, and students need to practice, experience and develop what they learn.

LEGEND:  T=teacher (also employer);

SS=students, (also employees);

K=knowledge, subject matter, opportunities for learning, classroom or work projects.

➡ =old paradigm instruction or new paradigm display;

New paradigm: ⊸ learning, pickup; ━━ =(SS); ▬▬ = Teacher

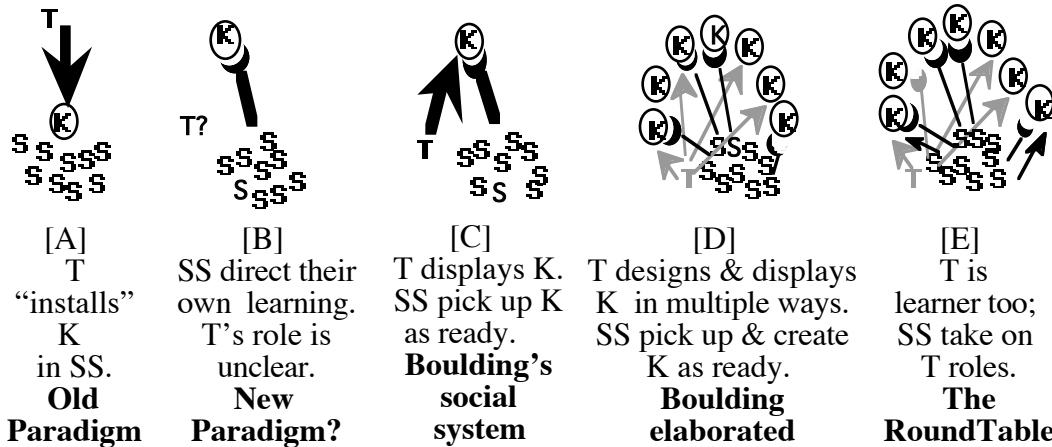| [A] | [B] | [C] | [D] | [E] |
|-----|-----|-----|-----|-----|
| T "installs" K in SS. **Old Paradigm** | SS direct their own learning. T's role is unclear. **New Paradigm?** | T displays K. SS pick up K as ready. **Boulding's social system** | T designs & displays K in multiple ways. SS pick up & create K as ready. **Boulding elaborated** | T is learner too; SS take on T roles. **The RoundTable** |

**Figure 5. Five Representations of large/whole-group learning (e.g., classroom, staff development)**

## Classroom and Meeting Practice

New models of the new paradigm have been emerging. Cooperative learning and whole language are among the most well known for classrooms; participatory management and dialogue for professional meetings. These new models have their drawbacks, though, as they are more difficult to implement. Moreover, scholars and practitioners frequently take conflicting positions, arguing for either directive or cooperative models. However, current research is finding that learner-centered strategies are most effective when used along with direct instruction and other methods. An intriguing new practice is the RoundTable, informed by Boulding's typology and systems thinking. It is an example of Figure 3E. In classroom RoundTable sessions, the teacher turns the activity over to the learners, who take turns leading the activity. The initial display is modified by consensus by the students and teacher. The professional meeting RoundTable session is a real-time example of participatory management, as the facilitator roles are distributed and rotating among all willing participants.

At the level of the organization, a current model for organizational change is systemic change. Systemic change is whole organization change as opposed to part organization change (or piecemeal change). Systemic change is difficult to implement, as it requires all members of the organization to be at a similar readiness for change. Moreover, as systemic solutions are currently conceptualized, they are costly (Helfand, 2005). For these reasons, and with the new understandings of the hard facts of soft systems gained

from this paper's elaboration of Boulding's typology of system complexity, the concept of systemic renewal is being proposed. Systemic renewal refers to a systemic change effort designed to allow each system member to learn and grow at his or her own pace.

The GEMS RoundTable is a specific practice that corresponds to the goals of systemic renewal. It is a large group learning/discussion activity designed to ensure equal participation. In schools, it is most frequently a 30-minute supplementary activity for lesson/agenda delivery. It is a tool for systemic renewal because it serves all members of the organization in one of their existing classrooms or meetings. The ISSS Morning RoundTable is an application of the GEMS RoundTable.

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