ABSTRACT. A review of the Journal of Organizational Behavior Management (1992-2001) was conducted to determine how “systemic” the applied behavioral interventions were. Criteria for the term “systemic” in an organizational behavior context were derived from Rummler and Brache’s (1995) Human Performance System (HPS). Six dependent measures derived from Rummler and Brache’s HPS were used to evaluate the systemic nature of the interventions. The dependent variables were classified into one of three mutually exclusive categories: whether the variable was modified, discussed but not modified, or absent. The classification of variables was used to determine the degree to which an intervention was “systemic.” Results indicated that considerations of systemic factors were often modified and rarely merely discussed. A majority of the studies examined dealt with 2, 3, or 4 of the 6 systemic variables evaluated. [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <http://www.HaworthPress.com> ©2002 by The Haworth Press, Inc. All rights reserved.]
KEYWORDS. General system theory, systems analysis, systemic, human performance system, behavior engineering model

A search of the PsycINFO_1887 database for the keywords “organization,” “systems,” and “analysis,” reveals that systemic views of organizations can be dated as far back as 1931 (Baridon & Loomis, 1931). In the case of Baridon and Loomis (1931) the authors’ view is systemic in the sense that they consider factors that lay outside of the organization itself (e.g., the available labor market) as influences of organizational performance. Over the last five decades researchers and practitioners have used the term systems analysis to characterize applications derived from general system theory (Bertalanffy, 1950), which is now more commonly referred to as general systems theory. Considering the common use of the term general system theory and its transformation into plurality, it is worth noting that general systems theory is a general theory of systems, and not a theory of general systems, as no such systems exist. Aside from this common misunderstanding of general system theory, another factor potentially suppressing the development and acceptance of systems analysis is the lack of a common definition.

A referencing of the dictionary yields: (a) system—“A group of interacting, interrelated, or interdependent elements forming a complex whole” (American Heritage Dictionary, 2000, p. 1757), and (b) analysis—“The breaking up or separation of something into its parts so as to examine them and see how they fit together” (Webster’s Desk Reference, 1993, p. 12). In a context of general systems theory, many authors have broadly defined systems. Laszlo (1975) takes note of this point and quotes such broad definitions given by Miller (1971), Hall and Fagen (1956), and Weiss (1971). Miller (1971) defined a system as, “a set of interacting units with relationships among them” (p. 281). Hall and Fagen (1956) define a system as, “a set of objects together with the relationships between the objects and between their attributes” (p. 18), whereas Weiss (1971) has used the definition, “a complex unit in space and time so constituted that its component subunits, by ‘systematic’ cooperation, preserve its integral configuration of structure and behavior and tend to restore it after non-destructive disturbances” (p. 14). Considering the generality of definitions such as these, one can easily see how confusion may arise. However, provided with a context of organizational and performance improvement, one can find more relevant, and more refined definitions amongst a collection of similarly broad ones.
Although many of the definitions relating to organizational contexts are in alignment with each other, there is undeniably a great variance in the degrees of their specificity. Redmon (1991) emphasized that the key factor in a systemic intervention is a description of organizational goals to which the intervention relates. Whereas a major contribution of this definition is that it frames behavior improvement efforts in a larger context to establish a focus on the benefits received by the organization for behaviors that are changed, it still leaves room for refinement should a more specific definition be required. Toronto (1975) and others (e.g., Brethower, 1982; Rummler & Brache, 1995) have used diagrams to assist in their definitions and explanations of organizational systems. The model presented by Toronto (1975) consists of: (a) authority figures, who have decision making power, (b) system structure, which is the totality of relationships among system components, (c) suprasystem structure, which is the totality of relationships among systems, (d) system and suprasystem programs, which refer to the changeability of aspects at both levels, (e) system activity, which is focused around production processes, (f) output system and criterion data, which represent products and services produced and the degree to which those products and services meet internal criteria, and (g) physical structure, which refers to the physical layout of the building and its contents (see Figure 1).

Notable contributions of this theory include physical plant layout and multiple levels of vantage, however it lacks essential components such as inputs, receiving systems, external feedback, and the level of specificity seen in the other two organization-level models presented in this paper (e.g., Brethower, 1982; Rummler & Brache, 1995). Although this model may have utility in areas such as organizational change, it does not fully represent the variables necessary to evaluate performance improvement through behavior change. Brethower’s (1982) Total Performance System Diagram (TPS) introduces the idea of an adaptive system; a system which can effectively respond to changes by adapting its components to cope with changes that occur in other system components (see Figure 2).

The TPS diagram is composed of a system characterized by: (a) a guiding goal or mission (the purpose for the existence of the system), (b) inputs to the processing system, (c) a processing system to produce products and provide/deliver services, (d) outputs (goods and services sold), (e) internal feedback mechanisms (the provision of feedback to workers on how well they are performing), (f) a receiving system (customers who buy products and services), and (g) external feedback
feedback from a receiving system). This model clearly defines relevant components of a system and further discussions of the model (Brethower, 1982; Brethower & Smalley, 1998; Rummler & Brache, 1995) provide insight regarding how to use the components to diagnose performance problems and leverage performance improvement efforts. A final organizational level model considered in this discussion is the super-system map (Rummler & Brache, 1995). The super-system map (see Figure 3) depicts a for-profit organization as:
...a processing system (1) that converts various resource inputs (2) into product and service outputs (3), which it provides to receiving systems, or markets (4). It also provides financial value, in the form of equity and dividends to its shareholders (5). The organization is guided by its own internal criteria and feedback (6) but is ultimately driven by the feedback from its market (7). The competition (8) is also drawing on those resources and providing its products and services to the market. This entire business scenario is played out in the social, economic, and political environment (9). Looking inside the organization we see functions, or subsystems, which exist to convert the various inputs into products or services (10). These internal functions, or departments, have the same characteristics as the total organization. Finally, the organization has a control mechanism—management (11)—that interprets and reacts to the internal and external feedback, so that the organization keeps in balance with the external environment. (pp. 9-10)

Collectively these models allow us to view organizational problems from a systemic perspective. All organizations can be viewed as systems, as they all involve an interconnected arrangement of parts; parts that, by definition, are related by a degree of interdependency. A cursory examination quickly reveals how the components of these models are interdependent. For example, if no internal feedback mechanism existed, those who produce parts would have no means of evaluating dimensions of their work (i.e., timeliness, rate, or quality). If substandard parts were produced, the receiving market would diminish, and revenue

FIGURE 2. Brethower's (1982) Total Performance System (TPS) Diagram (reprinted with permission)
would fall; and as revenue fell, profits to the stakeholders would be reduced. With reduced profits to stakeholders, the stakeholders might withdraw capital; and without capital to purchase inputs the processing system would likely fail (i.e., the company would initially produce less valuable products, and eventually may go bankrupt or otherwise cease to exist). Likewise, if there were no management function, internal and external feedback would not be interpreted and translated into business decisions that would dictate future courses of action; actions that would assist the system in maintaining effectiveness relative to its formally stated goals or mission.
The models of organizational systems analysis provide a framework for looking at various factors that affect performance; factors that reside within and outside of the business itself. Furthermore, the models clearly demonstrate the interrelatedness of functions within a system and the need to evaluate multiple components involved in performance diagnosis and improvement. Although the three models presented have varying degrees of specificity, the focus on organizational outcomes as opposed to changes in behavior is a common thread in each. As general system theory dictates, “Laws of the kind considered are characterised by the fact that they hold generally for certain classes of complexes or systems, irrespective of the special kinds of entities involved” and “There exist therefore general system laws which apply to any system of a certain type, irrespective of the particular properties of the system or the elements involved” (Bertalanffy, 1950, p. 138). Bertalanffy (1950) also stated, “... this law will apply to the pounds in a banking account as well as to radium atoms, molecules, bacteria, or individuals in a population” (p. 138).

Two phrases found in Bertalanffy’s (1950) quotes should be clarified; the phrases “certain classes of complexes or systems,” and “any system of a certain type” (p. 138). Bertalanffy discussed two types of systems, “open” and “closed” systems. Closed systems “… attain a time-independent state of equilibrium where the composition remains constant” (Bertalanffy, 1950, p. 156). Therefore, closed systems can be characterized as systems in which no materials enter or leave the system (Bertalanffy, 1950). Open systems are characteristically adaptive, and “maintain [themselves] in a state of perpetual change of [their] components” (Bertalanffy, 1950, p. 155). Like the classification of an organization, human behavior has been classified as an open system (Bertalanffy, 1950; Miller, 1955). Due to the adaptive nature of open systems they have generated a greater number of discussions and papers in comparison to closed systems. A search of the PsycINFO_1887 database for the terms “closed” and “systems” yields 444 results, and a search for those terms plus the term “theory” yields 127 results. Replacing the word “closed” with the word “open” and conducting the same two searches yields 1,208 and 357 results, respectively. In fact, some authors, such as Katz and Kahn (1966), refer to general system theory as open system theory. This focus on open systems is some indication of their value to applied problems and situations, and indicates the need for a solid model of human performance to be in compliance with the characteristics of open systems. By nature, open system theory is more applicable to human life and society than any theory of closed systems, and there-
fore warrants the attention it receives. For a more in depth discussion of the characteristics of open and closed systems see Bertalanffy (1950).

**PEOPLE AS SYSTEMS**

To its credit, Toronto’s (1975) general systems model of organizations incorporates multiple layers of an organization and depicts how various components can interact with each other. Rummler and Brache (1995) have also suggested a layered model of an organization which is created by recognizing three distinct levels of organizational analysis: (a) the organizational level, which focuses on large scale issues such as the organization’s relationship with its market, (b) the process level, which addresses concerns relating to the “flow” of work in an organization, and (c) the job / performer level, which addresses the performance of the people doing the work (see Figure 4).

For years behavior analysts have verified the importance and value of working in organizations by both working in them frequently and by achieving very notable results across various domains. To discuss these results here would be beyond this scope of this paper (for such a review and discussion, see Nolan, Jarema, & Austin, 1999); however, the manner in which these results have been achieved is not. Due to the nature of

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**FIGURE 4. Rummler and Brache’s (1995) Three Levels of Performance**

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general system theory and its postulation that a person can indeed function as a “system,” the laws of general systems can, and have been (e.g., Brethower & Smalley, 1998; Rummler & Brache, 1995), rightfully applied to human beings in organizational settings. Brethower’s (1982) TPS diagram embodies the postulates of General System Theory, and can be used at multiple vantage points. The utility of this model allows the practitioner to place almost any unit of analysis in the “processing system” box. In an organizational context this could manifest as an entire organization, a subsystem of an organization (i.e., the accounting department), or an individual performer being represented as a processing system (Brethower, 2002). Although other systems models are similar in theory, some have become more refined to accommodate a more specific processing system (i.e., a human being). Rummler and Brache (1995) propose a model for evaluating a person as a system in an organizational context. Their model, called the Human Performance System (HPS), is displayed as Figure 5. This model varies slightly from Rummler and Brache’s super-system model while retaining the core characteristics of open systems as defined in general system theory (Bertalanffy, 1950, 1956).

**SIMILARITIES AND DIFFERENCES**

Similarities retained by the two models reflect the underlying theory of the models derived from characteristics of open systems (Bertalanffy, 1950; Katz & Kahn, 1966). Four main concepts exemplified by Figures 2, 3, and 5 are the concepts of input, output, transformation of materials, and feedback. Whereas closed systems are characterized by their state of constancy, an open system may also achieve constancy; but will do so by achieving a steady flow of inputs and outputs. There is motion in open systems, and by nature they reflect life, movement, and in the context of an organization; work being completed. Viewing an organism as a system is not only justified, but in Bertalanffy’s (1950) own words, “Living systems are the most important examples of open systems and steady states” (p. 157).

Once one has considered the characteristics of open systems, the differences between the super-system map and the HPS become negligible. The reader may simply compare the two models side by side and see which components are missing from (or have been added to) each model, and see that the differences arise from different levels of van-
This difference in vantage does not invalidate either model, but rather demonstrates the utility of general system theory. A prime example of this utility is Brethower’s (1982) TPS model, which is complete, easy to understand, and can be used at all levels of performance, as it incorporates all of the primary characteristics of open systems.

THE BENEFITS OF TAKING A SYSTEMIC APPROACH

Taking a systemic view of human performance has many advantages. Such a view allows us to examine the context in which behavior occurs and identify factors that influence behavior; factors that may have otherwise gone unnoticed by the performer, management, or a well-trained behavior analyst. For example, without a systemic view of behavior, a behavior analyst may make recommendations to modify immediate contingencies when faulty materials are really to blame. Although a “false diagnosis” such as this may seem far-fetched, because behavioral technology dictates that behavior analysts explore potential environmental causes and systems, as organizational behavior is truly a function of the interaction between an organism and its environment (Gilbert, 1996), the possibility exists nonetheless. While many applied behavior analysts (see Baer, Wolf, & Risley, 1968 for a definition), or those whose works are in alignment with applied behavior analysis (e.g., Rummler & Brache, 1995), have recognized and discussed the importance of systems analysis, few have done so in the research literature. Much of what has been written on behavioral systems analysis can be found in books (e.g., Rummler & Brache, 1995; Gilbert 1996) or in chapters in edited handbooks (e.g., Austin, 2000; Brethower, 1982; Redmon & Mason, 2001). In fact, the authors of the current paper know of only two published studies that explicitly mention the use of a systemic model in performance improvement (e.g., LaFleur & Hyten, 1995; Austin, Olson, & Wellisley, 2001).

While there is a lack of explicit systemic analyses in the research literature, the participants and performances being researched are always members of some type of system. Systems are characterized by their interdependent relationships, and each component of a system interacts with other components (Hall & Fagen, 1956; Miller, 1971; Weiss, 1971). If behavior is a function of the interaction between an organism and its environment, and environmental components have interdependencies amongst them, then logic would state that a complete view of behavior and its determinants requires an analysis of all variables in the performance system. The difficulty then becomes defining where the performance system boundaries lie. Each performance model presented in this paper (e.g., Brethower, 1982; Gilbert, 1996; Rummler & Brache, 1995; Toronto, 1975) establishes those boundaries in places that incorporate different environmental or person-related variables; however, each has been designed with the intent of limiting variables to ones that are essential for a complete analysis while maintaining a man-
ageable scope. Adherence to a formal system or theoretical model, such as the ones presented in this paper, standardizes the procedure of evaluating variables that could potentially influence performance, provides a prompt for conducting accurate and thorough analyses, and can reduce the number of overlooked variables.

Due to the flexibility and comprehensiveness of Rummler and Brache’s (1995) HPS, it was the model chosen as the exemplary systemic model of human performance for purposes of this paper. This model was also the only model presented as a systemic view of performance solely dedicated to the analysis of the behavior of organisms that was identified in the literature review conducted for the purposes of this paper.

PURPOSE

In this paper, we attempt to make a case for the following points: (a) it is appropriate and beneficial to view organizations as open systems, (b) it is appropriate and beneficial to view humans and their behavior as open systems, and (c) Rummler and Brache’s (1995) HPS embodies all of the critical components of open systems, and therefore serves as a reasonable model by which to evaluate the systemic nature of an analysis of behavior. The purposes of this paper are: (a) to evaluate recent interventions described in the research literature based on the degree to which their analysis of behavior is “systemic,” (b) to emphasize the benefits of taking a systemic approach to performance improvement, and (c) to make suggestions for the enhancement of future research methods and application approaches.

METHOD

Inclusion Criteria

Articles chosen for review consisted of all applied studies, involving behavior change, that were published in the Journal of Organizational Behavior Management between the years 1992 and 2001. Only studies consisting of original presentations of data were included.

Dependent Measures and Category Classifications

Six dependent measures derived from Rummler and Brache’s HPS (1995) were used to evaluate the systemic nature of interventions. Un-
planned intervention components (i.e., a manager giving feedback without being asked by the experimenters, and the absence of any other feedback discussion or modification) were not included in the analysis. Each dependent measure was classified into one of three mutually exclusive categories as follows:

1. **Modified.** One or more of the six dependent measures were changed in form or character (i.e., altered, created, eliminated, or enhanced in some way). The experimenters/authors must have taken part in the modification in some way, shape, or form. Experimenters may have conducted the manipulation directly or indirectly by suggesting that company personnel carry out the action (i.e., the creation of a feedback mechanism or an incentive system where the organization or its employees deliver the stimulus).

2. **Discussed.** One or more of the six dependent measures were examined or considered in the text, and no alterations were performed concerning the components mentioned. To be placed into the discussed category the item must have been mentioned in the text, but it could not have been created or manipulated in any way by the experimenters. In other words, the item being discussed must have been in place before the intervention occurred, and would not have been considered a part of the intervention. An example of an item that would be classified into this category would be a description of a feedback or incentive system that was in place before the experimenters came on-site, and was not modified or created by the experimenters. Another example would be discussing a feedback system that was not in place, and deciding that such a system was not necessary; however, in the articles selected there were no such instances of discussing a component without it existing, or being modified in some way. It is worthwhile to note that the lack of modification is not necessarily negative thing. It is possible that the component discussed may not have required change to optimally contribute to the organization’s goals.

3. **Not present.** Not a single one of the six dependent measures was considered in the text in any way (i.e., the dependent measure was not discussed or modified). Since dependent measures placed into this category were not discussed or modified, the category essentially served as a measure of missed opportunities to discuss an HPS component. Due to the nature of this category it is not represented or formally discussed in the results section with the exception of Figure 6.
The six dependent measures derived from the HPS (Rummler & Brache, 1995) were defined as follows:

1. **Performance Specifications.** Established standards that comprise job goals. Performance specifications could have been derivatives of an overall goal or mission, but actual *standards or clarifications* for product or service characteristics were necessary to meet the criteria (i.e., measures of rate, timeliness, cost, quality, or other product, process, or service characteristics). Common *modifications* in this category included telling participants which behaviors were being observed, the creation of job descriptions, and goal setting.

2. **Task Support.** Resources available to the employee to assist them in achieving optimum performance (i.e., necessary equipment, job aids, information *other than feedback* that could be used for decision making, logical and efficient processes, process changes, and any form of verbal or written prompts that exceeded a recording form). Verbal troubleshooting was classified as *discussed* and a change in process was considered a *modification*.

3. **Consequences.** Planned reinforcement contingencies dependent on specified levels of performance (i.e., monetary or other incentives, the opportunity to engage in more preferred activities, and praise if it was specified as a consequence).

4. **Feedback.** Information provided to the participant on their individual or group performance that could be used to guide future performance (i.e., planned graphed, written, or verbal information on performance achieved by the participant or the participant’s group; altering or discussing methods by which feedback was provided).

5. **Skills/Knowledge.** Skills and/or knowledge required to produce products or services according to specifications (i.e., skills assessment, knowledge of priorities and overall mission, standardized tests, classroom or on the job training). A skills/knowledge intervention addressed immediate job-related tasks and focused on instruction, as opposed to physical supports or an individualized treatment for a person-specific issue.

6. **Individual Capacity.** A person’s physical, mental, or emotional capacity to perform at optimal levels (i.e., emotional assessments or counseling, physical supports, prosthetics). An individual capacity intervention affected the employee in either a physical
sense (i.e., physical support) or fit the context of individualized treatment for a person-specific issue (i.e., emotional counseling).

**Review Procedures**

Articles were reviewed and evaluated based on the six dependent measures discussed above, and each dependent measure was classified into one of the three mutually exclusive categories. If the research study involved data being collected on the behavior of two parties (i.e., a therapist and his or her client, or a teacher and his or her students) the evaluation was conducted on the person whose behavior was being changed directly by the researcher. For example, if a researcher modified the training behaviors of a therapist, and evaluated indirect effects on clients as well, the evaluation was conducted on the therapist’s intervention. When the behavior of two parties (i.e., therapists and clients) was directly exposed to the independent variable(s) by the researchers, the evaluation was conducted on both parties as a single unit of analysis.

**Reliability Checks**

A doctoral student who had successfully passed two courses devoted to systems analysis independently conducted reliability assessments in the same manner as primary assessments (described above) for 33% of the articles reviewed. Each article provided six opportunities for agreement or disagreement, with each opportunity representing the categorization of one of the six dependent measures derived from the HPS (i.e., 12 articles would provide 72 opportunities for agreement or disagreement). Reliability was calculated as a percentage by dividing agreements by agreements plus disagreements and multiplying by 100.

**RESULTS**

For each study reviewed, the number of dependent variables discussed and modified and the total number of areas considered were each calculated. The number of areas considered consisted of the sum of the areas discussed and modified in each study. For example, if a feedback system was implemented, task support was provided, and skills were assessed without training new skills, the intervention would be scored as having modified two components (e.g., feedback and task support), discussing one component (knowledge/skills), and considering three
components (feedback, task support, and knowledge/skills). This scoring system provides an assessment of the systemic nature of the intervention (i.e., items considered) and provides insight into how often assessments made with and without modifications occurred within that framework. Table 1 displays each study reviewed and how each dependent variable was scored.

Overall, there were 216 opportunities for dependent variables (HPS areas) to be considered (36 studies × 6 areas per study). Of these 216 opportunities, 9 were used to discuss dependent variables, 91 were used to modify dependent variables, and 116 were missed opportunities that fell into the category not present as described above (see Figure 6).

An analysis of the considered category (composed of articles discussed and modified) shows that performance specifications were considered in 75% of the articles reviewed (27 of 36), while they were discussed in 8.3% and modified in 66.7% (3 and 24 articles, respectively). Task support was considered in 52.8% of the articles reviewed (19 of 36), while it was discussed in 8.3% and modified in 44.4% (3 and 16 articles, respectively). Consequences were considered in 47.2% of the articles reviewed (17 of 36), while they were discussed in 2.8% and modified in 44.4% (1 and 16 articles, respectively). Feedback was considered in 61.1% of the articles reviewed (22 of 36), and all instances of consideration were also modifications (all 22 articles). Skills and knowledge were considered in 38.9% of the articles reviewed (14 of 36), while they were discussed in 2.8% and modified in 36.1% (1 and 13 articles, respectively). Individual capacity was considered in 2.8% of the articles reviewed (1 of 36), and the one instance of consideration was in the form of a discussion. Figure 7 represents the percentage of studies that addressed each of the six areas of the HPS (Rummler & Brache, 1995) and Figure 8 represents the percentage of each of the areas of the HPS addressed by either discussion or modification.

A final analysis considered the number of areas of the HPS (Rummler & Brache, 1995) addressed in each article. There was an average of 2.8 areas considered per article (range: 1-6). Six articles addressed 1 area of the HPS, nine articles addressed 2 areas, twelve articles addressed 3 areas, six articles addressed 4 areas, two articles addressed 5 areas, and one article addressed all 6 areas (see Figure 9).

Reliability was conducted on 33% of occasions (12 of 36 articles). Within the 12 articles reviewed for IOA purposes there were 72 opportunities for agreement (12 articles × 6 dependent variables per article), and agreement was scored for 70 of the 72 opportunities, yielding an interobserver agreement of 97%.
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<th>Author(s)</th>
<th>Year</th>
<th>Perf. Specs</th>
<th>Task Support</th>
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Note. D = Discusssed; M = Modified
DISCUSSION

For decades organizational theorists and practitioners have discussed organizations as open, adaptive systems. When professionals speak about systems analysis, or the existence of systems, a large-scale view is typically assumed. These large-scale views often revolve around issues pertaining to elements found in Rummler and Brache’s (1995) super-system map (refer to Figure 3). Typical examples of systemic views would be the evaluation of changing market trends, examination of a value chain of resources, or possibly the interaction of entire departments or functions within an organization. Although systemic views continue to add value at the organizational level, performance analysts at the individual (person) level often adopt a different model (for a review of performance analysis models see Austin, 2000). Typical models at this level (i.e., Bailey & Austin, 1996; Gilbert, 1996; Mager &

FIGURE 6. The Number of Dependent Variables Addressed by Category of Classification
FIGURE 7. Percentage of Studies That Addressed Each Dependent Variable
FIGURE 8. Percentage of Studies That Addressed Each Dependent Variable by Classification Category
FIGURE 9. The Number of Human Performance System (HPS) Areas Considered per Study
Pipe, 1970) factor in environmental variables, but they do not always do so in a systemic manner. By solely evaluating the relation of environmental variables to the organism, as the aforementioned models do, the researcher or practitioner is deprived of a unified format for analyzing the interdependencies or possible interaction effects between or amongst the elements—in such a case, these relationships are merely implied. Identifying environmental variables and their interdependencies would assist behavior analysts in achieving experimental control and a functional analysis of behavior as defined by Baer, Wolf, and Risley (1968).

In the current set of studies reviewed, the relationship between variables in the HPS (Rummler & Brache, 1995) was apparent in that all studies that contained feedback also contained performance specifications. If feedback were given on performance, then the participant in the study would become aware of which performances were being monitored (i.e., performance specifications). Although this occurrence may be an effect of the definitions used, the relationship between these two variables was not always bi-directional. For example, while the presence of feedback also indicated the presence of performance specifications, the presence of performance specifications did not necessarily indicate the presence of feedback. Knowledge of the relationship between variables such as these could enable more efficient behavior analytic interventions by capitalizing on existing relationships or interdependencies. In the case of feedback and performance specifications, leverage could be achieved by designing feedback to be as specific as possible, and to include all of the desirable functions of performance specifications. Although this is an obvious example, and one that behavior analysis has been effectively capitalizing on for years, other relationships such as this may go undiscovered in the absence of a “systems” view.

System theorists would agree that to view an individual as a system is just as valid as examining an organization as a system (Bertalanffy, 1950; Boulding, 1956; Brethower, 1982; Miller, 1955; Rummler & Brache, 1995). A system can be almost anything with interacting sub-units and throughput, and a systemic analysis depends solely on the level of vantage with which a system is viewed. For applied behavior analysts, the most appropriate level of vantage is to view the entire person as a system, as opposed to the organization of which the person is a member (super-system), or their internal organs (i.e., brain or stomach; sub-systems). Although it is uncommon for many practitioners to consider an
individual as a system (as opposed to a part of a system), it is a valid perspective in accordance with general system theory (Bertalanffy, 1950).

For practitioners to adopt a systemic view of performance at least two things must occur: (a) they must be exposed to a systemic model and be provided with the education or tools to use it, and, (b) the practitioner must be able to find value in the model. Gilbert’s (1996) Behavior Engineering Model (BEM) is a performance analysis model that, when used in its entirety, represents systemic thinking (see Figure 10).

The BEM is similar to the HPS (Rummler & Brache, 1995) in that they both consist of similar parts. If all six cells of the BEM were placed into a format like the HPS they would create a very similar picture. However, Gilbert (1996) does not recommend using the BEM in its entirety, and instead suggests progressing through the steps until a problem is solved—thus, the systemic value remains implicit in the model. Gilbert asserts that using the BEM is an efficient and cost effective way of solving the right problems; however, he does not recommend evaluating all variables dictated by the BEM if performance can be analyzed and corrected without doing so. To Gilbert, the use of the BEM is a matter of behavioral economics, as opposed to systemic thinking. On the other hand, Rummler and Brache’s (1995) HPS is drawn as a systems model, and encourages the evaluation of multiple components in every analysis. As the HPS was the only systemic model solely dedicated to human behavior identified for the purposes of this review, we suggest that researchers and practitioners utilize the HPS in order to assist them in achieving a more systemic view of human behavior and its related environmental variables.

For professionals to grasp this concept, they must expect, and achieve, some benefits. Although Gilbert (1996) raises the argument of behavioral economics, a complete investigation of all potential variables would undoubtedly yield a more accurate, though admittedly more time consuming, analysis. Gilbert (1996) recommends a sequence for diagnosing behavioral deficiencies that can be summarized as progressing from left to right across the upper cells of the BEM, and then left to right across the lower cells of the BEM. Therefore, following Gilbert’s suggestion, the following situation may occur. First, an analysis using the BEM may indicate that there is no feedback, and so a feedback plan could be implemented. After a few weeks, if performance had not improved, the BEM would dictate conducting an evaluation of the tools and equipment used by workers, and making adjustments if necessary. Again, after waiting a few weeks without performance improvement, some form of consequences could be applied. Theoretically this
process could continue until a performance analyst reached the lower right cell of the BEM and it could take many weeks to achieve performance improvement (for an example of a progressive intervention, see Acosta-Amad & Brethower, 1992). Even worse, if the performance analyst discontinued earlier interventions in pursuit of new ones, performance improvement may never be achieved, as the analyst could miss the critical combination of intervention components. It is highly probable that more systemic analyses would reveal a greater number of potentially influencing variables, and that consideration of a larger number of variables would result in better interventions and larger performance gains. In summary, although Gilbert’s (1996) BEM makes sense from a behavioral economics standpoint regarding solution implementation, it may be detrimental from an analysis standpoint. In other words, although it may make sense to implement solutions in the order described, it may be detrimental to conduct analyses in a similar fashion. It is this mindset that could account for the low number of studies that addressed the dependent variable individual capacity in the current review. It is interesting to note, however, that the one article (LaFleur & Hyten, 1995) that did consider this dependent variable (and all six dependent variables) was the only article reviewed that explicitly stated their use of Gilbert’s (1996) BEM as a troubleshooting algorithm.
In this case, the use of the model appeared to promote a systemic analysis, as opposed to progressing through the BEM in the manner described by Gilbert (1996).

Rummler and Brache (1995) examine an organization at multiple levels. In their analysis, they assert that if a good performer is placed in a poor system, the system will “win” every time. The system “winning” implies that eventually the good performer will begin to perform at lower levels on desired measures, either by direct limitations (i.e., equipment issues), or by improper contingencies (i.e., a lack of reinforcing consequences). Although the authors provide no data to support this claim, as system analysts, or behavior analysts, it should come as no surprise that this would be the case. From a systems perspective the performer is a component of a greater system (i.e., an organization, department, or process), and cannot avoid being influenced by other related variables, regardless of whether they are beneficial or detrimental to performance. From a behavioral perspective, behavior is a function of a person and their environment. If the environment were not conducive to optimum performance, one would not expect optimum performance to be achieved. This match of appropriate environment and appropriate contingencies should also aid the maintenance of interventions; yet however logical, this is another area in need of future research to provide data suitable for the evaluation of such claims.

In all fairness, the possibility exists that dependent measures may have been considered by researchers, but did not make it into the finished product of publication for a number of reasons. These omissions are often a product of the demand characteristics of publishing, such as limited space in each journal issue, the author having to decide what information is relevant enough to be reported, and the perceived appropriateness of a discussion of such variables for the journal in which the article is being submitted. When focusing on human performance improvement, researchers and practitioners have a tendency to focus on their manipulations as the sole influencing variable. In fact, a goal of behavior analytic interventions is to achieve an analysis of behavior as defined by Baer, Wolf, and Risley (1968), “… a believable demonstration of the events that can be responsible for the occurrence or non-occurrence of that behavior. An experimenter has achieved an analysis of behavior when he can exercise control over it” (pp. 93-94). Due to the molecular focus (i.e., contingencies immediately impacting a few behaviors) of most behavior analytic work one can often achieve an analysis of behavior without taking into account other external variables. It is possible that the attainment of robust effects decrease the relevance of
reporting external variables, but it is important to remember that organizational behavior is a function of the interaction between a person and his/her environment (Gilbert, 1996). Although an analysis of behavior was demonstrated in a particular environment, lack of knowledge of external variables in that environment could impede the replicability of that analysis. Additionally, although a behavior may be functionally controlled by the identified variables, the maintenance of that behavior is most often dependent on system factors (via other persons or processes) that are designed to support the improved or modified performance. With limited space to report findings, and the potential relevance unclear, it becomes apparent why systemic variables are often omitted in behavioral publications. Furthermore, notions that a description of systemic variables is inappropriate for the journal in question (i.e., almost any journal with the word “behavior” in the title) may only exacerbate these potential factors. It is factors such as these that may have contributed to such a small number of dependent variables (9 of 210 opportunities) having been discussed without modification, or not being discussed at all (94 of 210 opportunities). From a systems perspective, all variables that were considered should be reported, regardless of whether or not the specific variable caused a notable change in performance, as each variable combines to comprise the environment in which the performance was altered or engineered.

As a science, applied behavior analysis in organizational settings has proven its effectiveness, and it seems to achieve this level of effectiveness with great efficiency (e.g., Austin, Kessler, Riccobono, & Bailey, 1996; LaFleur & Hyten, 1995; Wilk & Redmon, 1998). However, as members of a progressing science, applied behavior analysts in organizational settings must realize that there is still work to be done, and further refinements to be made. A logical next step for behavior analysis in organizational settings is the development or adoption of a model that incorporates systemic factors into its analysis. As previously discussed, many performance diagnosis models exist (for a review see Austin, 2000), yet only one (e.g., the HPS) has been identified here as being explicitly systemic. And while many of these models ask similar questions, they sometimes go about doing so in a completely different manner. For example, Gilbert (1996) addresses person factors last while Bailey and Austin (1996) have placed a person-related question as the first question in their attempt at a unified algorithm.

Although general system theory (Bertalanffy, 1950) has been in existence for decades, the current state of affairs is that there is still a lack of
a unified, well-accepted, and even moderately utilized systemic algorithm for human performance diagnosis. The absence of such a model is merely one indication of the scientific youth of this field. Once a model is agreed upon and accepted, even further research will be required to define parameters on which variables are measured, and along which interdependent relationships are assessed. In addition to an assessment of critical variables, research will need to be conducted comparing the effectiveness of systemic analyses and interventions with the effectiveness of other currently accepted and utilized methods.

This review was written to evaluate the degree to which a selection of current behavioral interventions was “systemic,” and to discuss variables by which degrees of “systemic” can be assessed. The taxonomy used enabled us to identify the degree to which some interventions were systemic, and to further discover how often each of the dependent variables was discussed and modified. By discussing behavioral interventions in a systemic manner we hoped to shed light on some alternative methods for conducting performance analyses, provide a summary of theoretical benefits of using a systemic approach, and to stimulate research in the area.

REFERENCES


Articles marked with asterisks (*) were those included in the review.