Using an Instructional Systems Development Model as a Framework for Research on Scale Up [1]

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Abstract

This paper presents a framework for research on scale up applications based upon fundamental principles from the field of instructional systems development. In doing so, the paper (a) considers methodological issues in developing a framework for scale up, (b) overviews the foundations for and presents the major elements of the framework itself, (c) presents potential uses of the framework by researchers and educational practitioners engaged in scale up, and (d) uses the framework as a perspective for considering some possible priorities in future scale up research.

The problem of why schools are unable to sustain and expand their use of research-validated instructional interventions and the complementary question of how to enhance the capacity of schools to accomplish such outcomes has gained recognition as an important issue for linking research findings to school reform. Despite emphases in reform policy whose extremes range from encouragement to mandated requirements for school adoption and implementation of research-based interventions, there presently is only a limited understanding of how such a broadly defined objective can be accomplished with a high degree of certainty..

At this time, definitions of the concept of scale up can be encompassed within three interdependent facets. The first facet is the initial adoption by one or more schools within a school system of a research-based instructional intervention with sufficient fidelity to obtain performance outcomes previously established by research. The second facet is achieving success in sustaining the implementation across a period of time that is sufficient for the obtained outcomes to become an integral part of the operational performance standards of the school system. And, the third, given the successful sustainability of the intervention, is the subsequent expansion of the intervention to additional schools throughout the school system. So defined, and particularly because the effective scale up of a research-based intervention implies an adoption of the means for successfully raising performance standards, the inability of schools to accomplish scale up is a significant barrier to systemic school improvement.

Recognition of the importance of scale up framed within a context of school reform has received increasing attention in the literature in the past several years. At the same time, a multiyear Federal Interagency Educational Research Initiative (IERI) has helped maintain a continuing focus on this issue by supporting research projects on the process of scale up itself that are conducted by investigators who have previously established the validity of their interventions. Although significant progress has been made in some directions, there presently is still no recognized framework which is able to represent the critical dynamics of the scale up process while providing a systemic perspective for conducting scale up research. Just as the inability of schools to accomplish scale up is a barrier that limits school improvement, the lack of an existing

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framework to guide research on scale up is a barrier to gaining greater understanding of it. And, of equal importance, the inability of educational practitioners to accomplish the successful scale up of established research findings can only serve to raise questions about the potential value of such research for improving schools.

With the preceding in mind, this paper presents a general framework for representing the process of scale up that is grounded in the field of instructional systems development (and related disciplines). In doing so, the intent of the paper is not to present such a framework in a final substantive form. Rather, it is to apply a strategy of methodological adaptation of major elements from instructional systems development to provide the initial state of a framework whose subsequent development would evolve through its use by educators engaged in scale up research or applications. In doing so, the paper (a) considers methodological issues in developing a framework for scale up, (b) overviews the foundations for and presents the major elements of the framework itself, (c) presents potential uses of the framework by researchers or educational practitioners engaged in scale up, and (d) uses the framework as a perspective for considering possible future priorities in scale up research.

Methodological Issues in Developing a Framework for Scale Up

The development of a general framework for scale up and scale up research must address a number of issues if it is to be of value. This section considers these issues.

A Framework for Scale Up Must be Applicable to a Wide Variety of Interventions

In order to be of greatest methodological value, a framework for scale up must be able to encompass the widest possible variety of applications that are the focus of scale up. What this implies methodologically is that such a framework must be general enough to function as an architecture whose elements and dynamics can be instantiated for any specific intervention involved in the process of scale up. A simple example would be specifying the detailed professional development necessary for initiating an intervention and for implementing the follow-up support and supervision that is necessary to insure fidelity of a specific scale up implementation. Although virtually all interventions involved in scale up must have such an element to some degree, these elements will always be intervention-specific.

At the same time, although the framework for scale up must be as comprehensive as possible, it would be expected, depending upon the implementation requirements of specific interventions, that some of the elements included within such a comprehensive framework for scale up could be minimal or trivial for a specific intervention, again, depending on the nature of the intervention. For example, the implementation of a computer delivered intervention that is a minor elaboration of (or supplement to) regular classroom instruction would require minimal professional development and support. In such a scale up context, monitoring fidelity of implementation could be accomplished through student-generated computer records that, in turn, would require only a minimal effort of personnel involved in the implementation..

On the other hand, the scale up of a teacher-delivered intervention which requires substantial changes in instructional practices, such as our present *Science IDEAS* project which replaces daily 2-hour reading/language arts instruction in grades 3-5 with in-depth science instruction, would require far more extensive professional development, follow up support, and supervision. Overall, such forms of systemic interventions would require a far greater degrees of development of all aspects of the scale up process than those which supplement (rather than replace) existing practices, whether or not the

interventions are computer-based.

A Framework for Scale Up Must Explicitly Address the Dynamics Relating to Capacity Development

Although scale up is recognized as a complex multi-faceted process, the dynamics relating to the development of the capacity of schools within school systems to implement a scale up process is arguably the most critical of these. If the school system cannot gain the means to sustain and, subsequently, expand the adoption of the intervention, then scale up cannot succeed. In addressing this methodological issue, every specific scale up initiative must (a) explicate what is required to implement the intervention with fidelity and, having done so, (b) specify how the schools and school systems are to gain the specialized expertise and application resources that are necessary for obtaining implementation fidelity, and (c) evaluate the effectiveness of this element of the scale up process. Again, as in the preceding section, the specific resource demands for scale up of a particular intervention may range from those which are minimal (e.g., for a computer-delivered supplement that enhances ongoing instruction) to those which require a substantial effort by school and district personnel (e.g., for our *Science IDEA*S intervention which replaces reading/language arts with science instruction).

A Framework for Scale Up Must Represent the Transformation of a Research-Validated Intervention to the Form of an Intervention for which Scale Up has been Successfully Accomplished

Perhaps the major idea of scalability has to do with what is required for a study conducted by researchers to become a successful scale up application within applied settings, without the involvement of the researchers themselves. In this regard, an important aspect of scalability is that the original researchers must determine what is required to take the intervention "to scale" across a large number of settings in which the implementation is accomplished by others. In doing so, the researchers must necessarily explicate and develop the means to insure the functionality of all aspects of the implementation whose importance is magnified as the intervention is taken to scale by others and, then, to verify the operational effectiveness of these elements.

As an example, it may be that, in the implementation of their original research studies, the researchers were able to apply their in-field, methodological expertise to personally monitor and support the fidelity of the experimental intervention. However, as part of taking the research intervention to scale, the researchers must explicate a monitoring and support procedure that others ultimately are able to follow to obtain a similar level of fidelity in applied settings without active involvement by the researchers. If this cannot be done, then the scalability (or successful scale up) of the intervention is unlikely to be successful. In this regard, the role of a framework for scale up is to offer guidelines that methodologically facilitate the effectiveness of scale up initiatives.

A Framework for Scale Up Must Provide a Substantive Focus for Research on Scale Up

An important issue associated with scale up is how research that enhances the understanding of scale up should be designed. Interwoven within this important issue are several complementary perspectives.

Experimental design standards for validating research interventions. The first of these perspectives has to do with what research design requirements are logically required for establishing the effectiveness of a research intervention itself. Accepted as standards for undertaking such research with experimental validity are design

characteristics commonly associated with the textbook notions of internal and external validity. With respect to internal validity, the fundamental logic of experimental design is simple and direct. Within a valid experimental process, random assignment of participants to treatment conditions and experimental control that insures either the equivalence of all other aspects of the experimental setting or their random assignment to treatment conditions are the major design requirements for concluding that obtained differences in performance that were associated with treatments, in fact, did result from the differential assignment of treatments to participants. In effect, a sound conclusion from valid experimental research is in a logical form that asserts it was the "treatment" that resulted in the obtained performance differences, not other factors. So the methodological intent of these key design characteristics is to eliminate possible sources of experimental bias and confounding of the treatment with other variables that otherwise might be plausible explanations of the research findings.

Despite providing the proper methodological emphasis for valid experimental research, the notion of internal validity is subsumed under the broader idea of replication of research studies. In fact, in order for the findings of a well-designed experiment to be accepted as an addition to any disciplinary knowledgebase, the findings must be replicable by others. From a logical standpoint, having an internally valid design is certainly of importance; but, from the standpoint of a single study, it can only be suggestive of the potential replicability of the original findings. Thus, establishing that the findings of research study have been replicated across a variety of settings is a much higher methodological standard than reporting the findings of an individual study alone. With respect to the preceding, in the logic of scientific research, patterns of findings resulting from replicability of studies overwhelms any concerns about the findings of any single study.

Experimental and non-experimental standards for scale up research. Although research designed to validate the effectiveness an interventions and research designed to confirm the validity of a framework for scale up follow the same logical design constraints, in fact, they operate in very different contexts. Ultimately, the primary purpose of a specific scale up initiative is to establish the replicable extension of the effectiveness of an original research-based intervention which has been adapted for use in an applied setting. Thus, the broad idea of replication in establishing the performance outcomes and fidelity of implementation is a primary focus of all specific scale up initiatives. In this context, such forms of research are most appropriately called evaluative research. And, while such evaluative studies can provide sound evidence of the successful scale up of a particular intervention- a finding with important systemic implications- such evaluative studies are not research on the process of scale up itself. Rather, when successful, they are demonstrations of the effective scale up of particular research-based interventions.

The view of research on scale up presented in this paper is distinct from research designed to establish the validity of an intervention or from evaluative research verifying the effectiveness of a specific scale up initiative. Although both of these are important, the purpose of scale up research is to advance understanding of the process of scale up itself. In the pursuit of such research, a two important elements are involved. The first element, advancements in the understanding of scale up, consists of research conclusions that certain dynamic characteristics of scale up are predictive of scale up success across the widest possible variety of specific scale up initiatives. Such research should be undertaken through the combination of descriptive, correlational, and experimental research. Ultimately, if the presence of one (or more) dynamic characteristics of scale up can be shown to result in successful scale up when incorporated into the scale up process,

then the validity of such characteristics to scale up in general can be considered to have been established through replication. In turn, such forms of evidence can be considered to contribute to an increased knowledge of scale up.

The second element of research on scale up is closely related to the preceding. This element consists of constructing a framework for scale up that represents the substantive constituents of the process of scale up itself. In effect, this framework should be considered a kind of "procedural theory" that structurally represents the major dynamics that comprise scale up. Such a framework, the focus of the present paper, serves as a guideline both for scale up applications of particular interventions and for empirical research on scale up. In turn, the evolution of the framework for scale up is informed both by scale up initiatives and by scale up research findings. Together, these two empirical sources provide a means for the development of a comprehensive framework for scale up.

An Instructional Systems Development Framework for Scale Up

The strategy underlying this paper is to apply the general methodology used in instructional systems development as a framework for scale up and scale up research. As the following sections illustrate, this strategy is applicable to the problem of scale up because both methodologies involve the same major elements. In fact, the primary difference is one of perspective. In the case of scale up, the problem is to transform a research finding established in a limited scope into an intervention that can be implemented across a large number of applied settings in which individuals other than the researchers are responsible for fidelity of implementation. In turn, if fidelity of implementation can be established under scale up, then performance outcomes similar to those demonstrated in the original research setting would be expected to be obtained in the applied scale up sites.

In contrast, instructional systems development begins at a different point. While an application may have a research foundation, the primary goal of instructional systems development is to construct and validate an intervention that will produce a specified outcome by engineering the intervention that so that it can be implemented effectively by practitioners. In doing so, the design goal for every systems element is to minimize the resource-requirements for start up training and follow-up support much as possible in order to maximize the potential scope of applicability. The major empirical element of all variants of instructional systems development models is the use of successive field-test-revision cycles until the required implementation standards and performance outcomes are established as being accomplishable by consumer practitioners.

Although scale up and instructional systems development reflect different perspectives, both have the equivalent goal of constructing interventions that can be implemented effectively by practitioners and that, if done so, produce specified performance outcomes. The remainder of this section expands and applies the preceding analysis by (a) overviewing how a process of "reverse engineering" can be used to identify the constituents of instructional systems development models in a fashion that allows their application to scale up and (b) presenting an instructional systems based framework, including these constituents to represent the major dynamics of scale up that we have adapted to our present IERI project. As a result of such an analysis, the instructional systems development framework presented offers a means for identifying and relating patterns of similarities across the variety of ongoing studies of the scale up process. And, in doing so, the resulting analytic framework has the potential to contribute toward an acceleration of the progress of scale up research and applications that

otherwise might require far greater extended time periods to evolve.

Representing Scale Up as the Operational Transformation of a Research Study into an Effective School Application: A "Reverse Engineering" Perspective

This section focuses on two perspectives for considering of scale up. The first perspective represents scale up as a transformation of the procedures used in an original research setting into operations that can be used in applied settings. Then, given the first, the second perspective considers scale up as an instructional systems development process that can be "reverse engineered" to provide the foundations for a more comprehensive framework for scale up.

Scale up as a research to practice transformation. Perhaps the most important perspective in approaching scale up research is recognizing that the objective of any scale up initiative is the operational transformation of a study conducted in a highly-controlled setting by researchers with specialized expertise into a school application that can be implemented effectively by practitioners. Thinking of the transformation as occurring from a research context to an applied one allows a number of critical issues to become salient. The most important of these is that the transformation of the dynamics used to implement the original research study is necessary but not sufficient. While the dynamics of the original study must be explicated by the researchers to allow their adaptation for use by practitioners (as discussed previously), the scale up process also requires an augmentation of the original research dynamics that is driven by scalability requirements.

For example, explication of the expertise-based process that researchers followed to establish requirements for the fidelity of a future scale up study would be based on the procedures used in the original study. However, considering possible implementation across a greater number of settings, a management system to insure the effective use of such a researcher-explicated process for monitoring fidelity would be a requirement that is scalability-driven, i.e., not part of the original research study but needed for scale up. More specifically, this means that because the scope of the scale up process itself encompasses a far greater number and variety of settings that are well beyond the original research context and the capacities of individual researchers, additional elements addressing the resulting scalability requirements must be explicated and added to the operations as necessary for implementing the intervention more broadly. Finally, as a parallel requirement, the process of scale up itself also must provide the means for building the capacity in the applied settings that is necessary to sustain and expand the transformed research application that is to be implemented.

Insofar as the transformation of an original research study to a form that can be effectively scaled up is concerned, it is useful to consider the process as occurring across what might be considered a transformational continuum. One end of such a continuum could consist of the context and the procedural steps followed by the researchers to conduct the original research study. Further along the continuum could be the replication of the original study by other experienced researchers. This implies an explication of the operational elements of the original study (as based on the methodology section of the research report). Again, further along, could be the replication of the original study (under controlled conditions) by novice researchers who are guided and supervised by experienced researchers. This evolution requires addressing scalability issues relating to management of the research studies (i.e., adding explicit procedures for insuring fidelity of implementation), along with an adaptation of the operational dynamics necessary to implement the study in a form that novice researchers would be able to use. And, finally, could be the multi-site extension of the research implementation to relatively uncontrolled (vs. controlled) application settings by practitioners who, again, would be

the equivalent of research novices. This final scale up step may require substantial adaptation and augmentation of the original multi-site operational dynamics developed for the preceding stages.

The idea of a research-to-practice continuum for extending the scope of a study is a useful perspective for scale up. In particular, it provides a meaningful context for representing important elements of the scale up process, including the necessary explication and adaptation for practitioners of both the operational dynamics of the original research study and the additional operational dynamics addressing scalability-driven requirements. In turn, such explications implicitly specify the operational requirements for capacity development that must be addressed if scale up is to be successful.

Scale up as a "reverse engineered" instructional systems development model. As noted previously, the purpose of instructional systems development is the construction and empirical validation of interventions that produce specified outcomes by engineering the intervention so that it can be implemented effectively by practitioners. Within the development process, the question of validation is addressed through the use of successive series of field-test-revision cycles until the required implementation standards and performance outcomes are confirmed.

In understanding the applicability of an instructional systems development architecture to scale up, it is useful to decompose and identify its major constituents-- a type of "reverse engineering." Although in development and application these major constituents interact, here they are considered to be independent entities within any possible implementation package that has been empirically validated as effective and placed in use. First, because of the empirical validation process, use of the intervention can be associated with expected outcomes that ultimately justify initiating and continuing it. Second, by design, the intervention is explicated in a form that specifies how it is to be implemented. Third, also by design, the intervention has an explicit management system through which the actual implementation is controlled. And fourth, again by design, the intervention comes with validated processes for building (and maintaining) the various kinds of capacity (e.g., intervention, management) that are necessary for implementation.

Together these instructional systems development constituents are not only directly relevant to scale up; but are also are located in a comprehensive overall architecture that serves as a framework for how they are able to provide the means for initiating and continuing an empirically validated intervention. With this perspective in mind, the scale up framework presented in the remainder of this paper can be considered to be grounded on the major elements of an instructional systems development model engineered to result in interventions that can effectively initiated, sustained, and expanded.

An Instructional Systems Development Framework for Scale Up and Scale Up Research

This section presents a framework for scale up that has evolved from applying the principles of instructional systems development to our own work in scale up. In doing so, the definition of scaling used in our present IERI research project is primarily a functional one that establishes as success criteria and links together (a) the fidelity of implementation of an intervention and (b) the outcomes associated with that intervention. Within these dual success criteria, we consider scaling from three different interdependent perspectives that reflect the published literature, information gained at the IERI-sponsored conferences, and our own backgrounds in educational research and development.

In considering the following framework, it is important to stipulate that it does not address specific intervention or implementation procedures themselves. Although these procedures are the substantive focus of any scale up initiative, to address them in detail would unnecessarily complicate and limit the generalizability of this presentation. However, this aspect of scale up is considered in the following section on scale up research. In addition, the following discussion recognizes that both the initial intervention and implementation processes defined within an initial scale up initiative may be developed through a variety of means, ranging from a top-down design established prior to scale up to a bottom-up prototyping approach. For the purposes here, it is assumed that whatever means were used to establish initial procedures, all aspects of them can expected to evolve during the initial phases of any scale up initiative which are likely to function as the equivalent of an instructional systems development style of field-test and revision cycles. Finally, the framework is presented in a general form that is applicable to scale up initiatives for which the intervention is person-delivered and involves a significant (if not paradigmatic) change in regular practice. Thus, in considering the framework for less systemic interventions (e.g., computer delivered, supplementary vs. replacement interventions), the resource demands for some of the elements may be minimized.

The following framework for scale up is presented through three complementary perspectives. The first perspective considers scaling as a multifaceted process that consists of three overlapping and interdependent conditions relating to the implementation of an intervention: sustainability, expansion to new sites, and supportive institutional dynamics for scale up support. The second perspective considers scaling as a transformational process whose scope encompasses an ordered evolution from research-implementation, to collaborative implementation with school personnel emphasizing systemic capacity development, to the transfer of the responsibility of the implementation from the researchers to school personnel. This second perspective is the original multi-phase scale up design used in our present IERI project that emphasizes these three key transformational processes to address the major criteria for scalability success in obtaining sustainability, expansion, and supportive institutional dynamics (i.e., the conditions in perspective one). Finally, the third perspective consists of how the preceding two perspectives serve as an framework for scale up operations, for representing scale up design in a form that is transportable, and for framing research on scale up itself. Each of these perspectives is discussed below.

Perspective 1: Scaling considered as a multifaceted process involving three conditions. As Figure 1 shows, the first condition associated with scaling consists of an initial implementation (i.e., start up) of a research-based intervention for which a school system is able to demonstrate the capacity necessary to implement the intervention with fidelity and obtain performance outcomes that parallel those demonstrated through the original research studies that established the scientific validity of the intervention. This condition implies that having a systemic capacity for sustainability is a prerequisite requirement that must be met before subsequent expansion of the intervention to new sites can be accomplished (i.e., successful scale up of an intervention implies a capacity for sustainability as a prerequisite condition). If the internal systemic capacity for sustainability is not present, then it must be developed.

The second condition associated with scaling is the actual scaling up (or expansion) of the intervention to new sites. Again, if scale up is successful, then, at new sites, the intervention must be implemented with fidelity and obtain performance outcomes that parallel those obtained in prior successful implementations (i.e., under condition one). And, again, if the internal systemic capacity that insures the cumulative

sustainability of all previous sites is not present to support further expansion of the initial `implementation to new sites, then it must be developed.

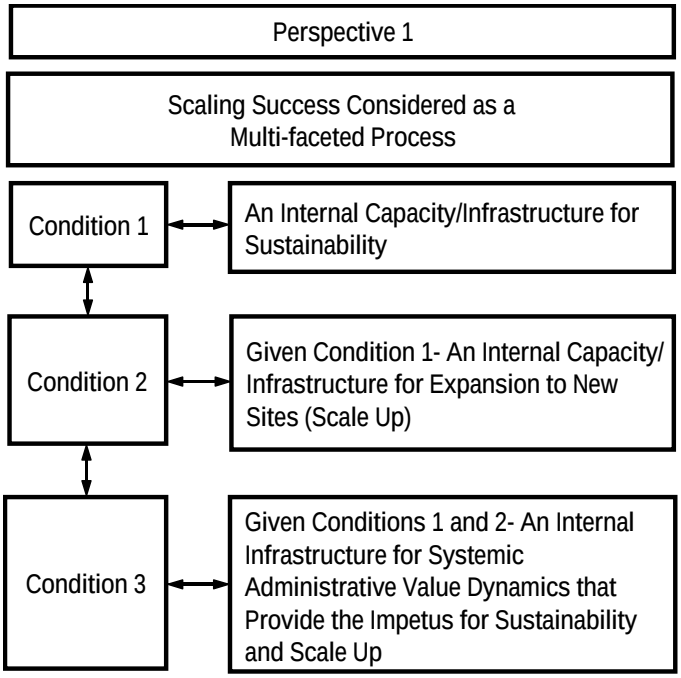

Figure 1. Perspective 1- Scaling Success Considered as a Multi-Faceted Process

As discussed above, conditions one and two overlap in an interdependent fashion because they represent different perspectives of an evolving scale up process that is composed of a capacity for sustainability on one hand and a capacity for adding new sites on the other. By representing these two overlapping capacities separately, it is much easier to focus on the different aspects of each in a fashion that insures that both occur optimally within an evolving scale up setting. As a result, the operational mechanics associated with developing the capacity for sustainability and expansion that are both required for scaling can be addressed more efficiently. In particular, in our multi-phase scale up design, the establishment of sites (e.g., schools) which are able to sustain implementation of an intervention with fidelity and obtain consistent performance outcomes also provides a major source of future internal systemic capacity for scale up by serving as models that provide mentoring support to new sites.

The third condition associated with scaling has to do with the establishment and maintenance of the continuity of the administrative dynamics that underlie the sustainability of the intervention and provide an impetus for expanding the intervention to new sites via scale up. We view these dynamics to be represented as forms of increased student performance expectations that are recognized to be engendered as “added systemic value” through the use of the intervention and, therefore, provide the systemic incentive for sustainability and scale up. In turn, the resulting systemic commitment to sustainability implies that an explicit component in the existing administrative infrastructure must be established to serve as a basis for quality-control of the implementation at all sites and for the allocation and management of the resources that provide the capacity for expansion and sustainability (as a dynamic form of maintenance). Along these lines, there are significant implications for capacity

development that derive from the fact that any form of scale up commonly magnifies the importance of some elements that comprise the processes involved that are unimportant within a small-scale context (e.g., monitoring the fidelity of one school vs. fifty different schools, scaling up in one school vs. fifty schools, insuring the sustainability of one school vs. fifty schools). In our present view of scaling, the identification of these critical elements best results from a careful explication of the scope of what is required to support the sustainability and expansion being pursued for a particular scale up initiative.

If the preceding conditions are not met, then scale up is not likely to be successful. For example, focusing scale up on expansion alone may result in a series of new sites adopting the intervention as older sites abandon it. Or accomplishing sustainability of successful fidelity and outcomes for an intervention may not prevent its being abandoned due to a change in administrative priorities or policy. Or, simply adding new sites without having the means to support the implementation of an intervention is likely to result in failure of scale up. Rather, our belief is that condition three (i.e., the explicit assignment of institutional value to the intervention) must be established if successful implementations are to be sustained as a systemic initiative. At some point, within the "value added" context of condition three, the systemic capacity to support conditions one and two must be operational if the combined sustainability and expansion to new sites that comprise scale up (or scalability) are to be successful.

Perspective 2: Scaling considered as a transformational process accomplished through a multi-phase design for capacity development. The multi-phase scale up design used in our project recognizes that an agent that provides an enhanced resource capability beyond the scope of regular school system operations must be operative in a prosthetic fashion in order to develop the capacity of a school system to sustain and expand an intervention. In the context of our study, this agent consists of the IERI project staff. In turn, as Figure 2 shows, our multi-phase scale up design consists of three components: (a) an intervention phase, (b) an implementation phase, and (c) a transfer of responsibility phase.

In the first phase, the intervention phase, the focus is on sequentially initiating and then adding elements of the intervention (e.g., once teachers are able to master fundamental elements of the model, then advanced components are introduced as elaborations of those fundamental elements). Toward this end, project staff provides all of the necessary expertise and resource support to work directly with sites to insure implementation of the intervention with fidelity. Primarily this resource support consists of professional development, implementation planning, and ongoing support (i.e., assuming responsibility for all aspects of the implementation.)

In the second phase, the implementation phase, the project staff (as an agent) works collaboratively with school system staff at all administrative levels to provide guidance and support for the establishment of the implementation architecture that is necessary to accomplish (a) successful implementation of the intervention, (b) sustainability, and (c) expansion to new sites. In this phase, project staff works hand-in-hand with school personnel at different levels to help them develop the institutional capacity necessary for successful scale up. Examples from our IERI project are working with principals to help them to adopt the fidelity monitoring process used by project staff, or to help them establish and learn to participate in grade level curriculum planning with teachers. Another example from our project is identifying teachers with leadership/ mentor potential (as a capacity development element) and helping them to prepare to offer professional development and serve as mentors for teachers in new schools. In effect, phase two is collaborative while phase one is directive. But, in phase two, the multiple support systems used by project staff in phase one to insure implementation of

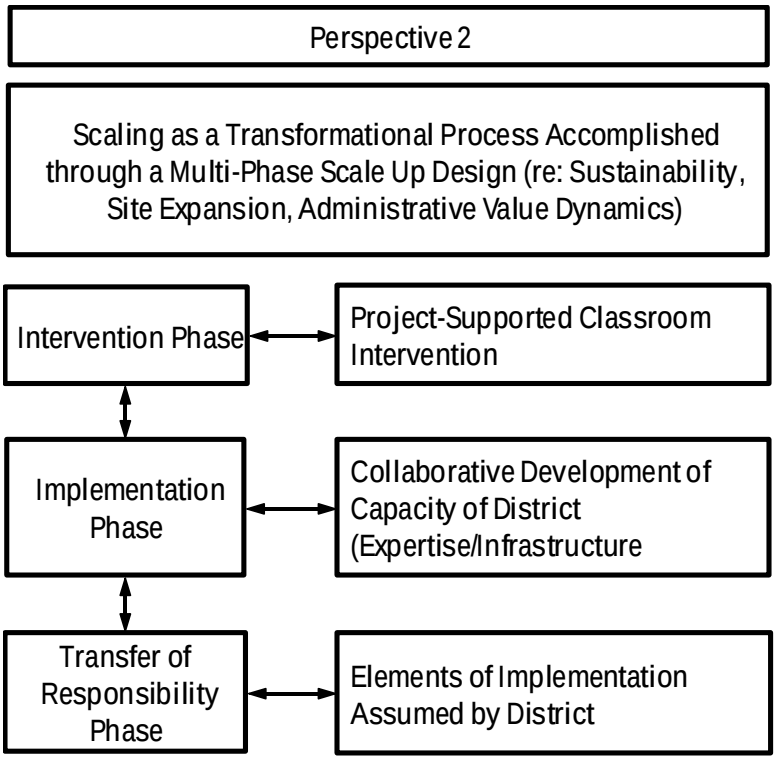

Figure 2. Scaling as a Transformational Process

the intervention with fidelity provide the framework for all phase two operations with school personnel at different levels

In the third phase, the transfer of responsibility phase, school system personnel assume responsibility for all aspects for the implementation and the project staff withdraws and assumes a consultive support function until no longer needed. If sustainability (with continuing scale up) can be maintained in terms of implementation fidelity and performance outcomes, then the scale up process can be considered successful.

Although the three phases of the scale up design can be separated conceptually, in practice different aspects of implementation are likely to be at different phases of transformation. For example, the process of building the capacity of teacher leaders to provide professional development may progress through phase two well in advance of principals becoming involved in monitoring the fidelity of implementation or serving as curriculum leaders in grade level planning. In turn, the active involvement of principals in curriculum planning may be well ahead of establishing the institutional achievement expectations produced by the intervention that dynamically drive the sustainability and scale up (expansion) support for the intervention. However, just as it is useful for purposes of operation to distinguish the preceding conditions of scale up, the multi-phase design also provides a useful perspective for representing the operational state of the project with regard to scale up. And, again, the idea of the multi-phase scale up design provides a way to focus attention on the development of the institutional capacity that is necessary to accomplish scale up successfully across the different facets of a scale up project while representing the process in a fashion that enhances the transferability of the

scale up design itself to other interventions in other settings.

Perspective 3: Using Perspectives 1 and 2 (Conditions associated with scaling and the multi-phase scale up design) as a framework for scaling operations and research. The three conditions associated with scaling (sustainability, expansion, institutional dynamics) provide an operational context for instantiating the multi-phase scale up design as a capacity development component for specific interventions. Considered together, these two perspectives provide a project with the conceptual means to represent and focus attention on the major issues that must be addressed in order for scale up to be accomplished successfully. In addition, as discussed above, these two perspectives (scale up conditions, phasing of capacity development) also provide a contextual framework for representing research findings in a form that are relatable to aspects of the up process that different scale up projects are pursuing. And, in doing so, the two perspectives also provide a framework for enhancing the transportability of the scale up design (and research findings) to new settings with new interventions.

Use of the Instructional Systems Framework for Scale Up Research and Applications

Figure 3 summarizes the three perspectives that provide an overall framework for scale up research and applications. As Figure 3 shows, the two perspectives provide an explicit framework for approaching the process of scale up. As noted above, the criteria for successful scale up are (a) that an intervention can be implemented with fidelity and produce performance outcomes previously established through research, (b) that such outcomes can be shown to occur in a consistent fashion across an increasing number of

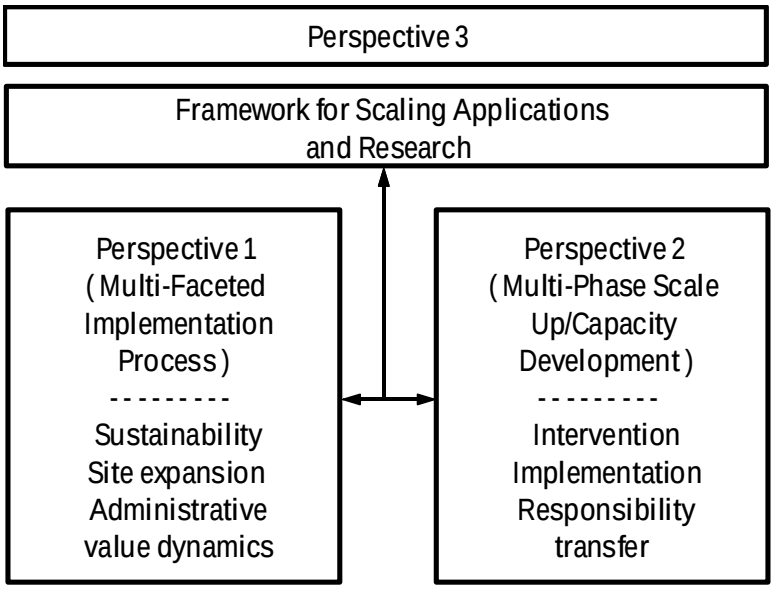

Figure 3. Overview of the major elements of an instructional systems framework for scale up research and applications.

sites, and (c) that the capacity for meeting these implementation requirements can be met by the institution. Given these criteria, this section discusses the application of the framework to scale up application and research.

Use of the framework in scale up applications. From an application standpoint, Figure 3 suggests that in order to accomplish scale up successfully, all scale up initiatives should organize their specific efforts under two complementary perspectives. Focusing on the first perspective, scale up initiatives should first develop their initial intervention and implementation procedures to establish sustainability before broadening them for site expansion. From an instructional systems perspective, this implies that the initial number of sites should be limited to those that can be supported by project staff. From a development perspective, such initial sites would provide for field-testing (and revision) of the scale up intervention and implementation procedures and practices as necessary. In turn, once these stabilize, then their application to new sites (i.e., scale up) is appropriate.

At the same time, as the preceding is occurring, the scale up project should make a concentrated effort to identify ways in which the administrative dynamics that establish the value of all of an institution's outcomes can incorporate those resulting from the intervention undergoing scale up. With regard to administrative dynamics, it is important to note that in cases in which the purpose of an intervention is to improve performance on well-established (and presently measured) institutional outcomes, establishing the "value added" by the intervention to the institution can be straightforward. However, in other cases in which the "value added " by the intervention to the institution is not measured within the regular operations (e.g., performance assessments) of the institution, establishing such added value is a far more complex endeavor. The latter case, which requires expanding the value structure of the institution, should be approached as a longer term, cumulative process.

Secondarily, given the focus of the first perspective (see Figure 3), the second perspective focuses on initiating an evolutionary transfer of the responsibility of implementation of the intervention from the project staff to regular school system personnel. This, of course, is a major scale up objective and is primarily a matter of capacity development (given the substantive procedures or practices to be implemented). In considering the second perspective, the concept of phasing is useful. First, it is important that the adaptation of the original research procedures for use in an applied setting allow for the phasing in of the intervention. If the intervention can be implemented initially, then this is not necessary. However, if the intervention is person-delivered and hierarchically or sequentially complex, then it can only be implemented in stages. This is an important scale up issue because it implies that the design of the initial personnel training, follow up support, and subsequent training must be carefully structured to be consistent with the established principles of instructional systems design. One particular guideline used in our IERI project which does implement the intervention in stages is that all additions to the intervention are approached as elaborations of what teachers have been asked to do initially, which is the curricular equivalent of emphasizing "big ideas" or "core concepts" in instruction. In any case, the phasing of the intervention itself is should be approached as being jointly a function of (a) the overall intervention requirements, (b) a comprehensive design for initial training, follow up support, and subsequent training on new elements, and (c) the resources necessary to undertake the required training and support. Essentially, the phasing in of the intervention should be considered a form of capacity development in its own right.

As important as the phasing in of the intervention is to the overall scale up process, the second and third elements of the multi-phase model (see Figure 3) are of even greater importance. Together these two phases represent the dynamic processes through which scale up is accomplished. As noted previously, the initial phase of this process is that all aspects of the implementation are conducted by project staff. Again,

following instructional systems development principles, it is critical that the scope of the initial scale up is limited to the number of sites that the project staff has the resource capacity to support. Within this "start up" initiative, the major development goals should be to refine the implementation system itself as necessary so that it is (a) able to sustain the implementation and (b) provide an effective means for expanding to new sites (i.e., scale up).

At the same time, within the "start up" initiative in a limited number of sites, the project must work collaboratively with school and school system personnel to develop the capacity of the institution to sustain and expand the implementation. Under ideal conditions, the function of the project staff is prosthetic in that it provides guidance and support until existing school personnel are able to assume responsibility. However, it must be recognized that to the extent extensive development of specialized expertise is necessary, the capacity development that is the goal of this phasing process can become highly complicated and demanding of project resources. In our IERI project, we have established an expanding "teacher leadership cadre" that has a variety of functions: (a) to establish their classrooms as models for fidelity, (b) to provide mentor support for other teachers within and between schools, (c) to be able to gain the expertise to conduct professional training for teachers in new project schools, and (d) to provide general support for the value of the intervention (e.g., by allowing classroom visits from teachers in other schools considering adoption of the intervention). In a similar manner, all of the project principals also have been formed into a cohort to provide mutual support their leadership of the intervention in their schools, and to communicate the rationale and outcomes of the intervention to other principals, central administrators, and parents.

In effect, all scale up initiatives should include a comprehensive "transfer of responsibility" plan that specifies what the responsibility of school personnel at all levels would ultimately have for the implementation. Although such a plan would be subject to revision, the implementation phase of scale up (see Figure 3) should specifically target the capacity development of all of the appropriate school and school system personnel so that the institution, overall, is able to sustain and expand the intervention. As the initial scale up sites are initiated and evolve, the project should begin to involve the appropriate school/system personnel as soon as practical. Following instructional systems development principles, the form of collaborative involvement should involve five major elements: (a) being aware of a particular project operation, (b) gaining the capacity to conduct the operation, (c) assuming responsibility for the operation, (d) gaining the capacity to train others to conduct the operation, and (e) becoming an advocate of the implementation and the importance of their role in it.

The completion of the sequence (a) through (d) above implies that the project staff should be able to withdraw from that specific component of the project. However, at the same time, it is important that the project staff maintain some involvement in all phases of the scale up initiative until two conditions are met: (a) that appropriate school and school system personnel are able to assume responsibility for all aspects of the implementation and (b) that the "value added" contributions of the intervention have been established as part of the ongoing administrative dynamics. This should be considered a critical aspect of the scale up process, because, if it is not accomplished explicitly at the institutional level (vs. the individual support of administrators), then sustainability of all of the different aspects of the instructional system that comprise the scale up are unlikely to be maintained in a stable fashion. Because of the importance of the transfer of responsibility phase and the concomitant withdrawal of project staff from the operational implementation of scale up, it is included as a distinct element in scale up. As such, as the project evolves, the scale up initiative should develop a comprehensive transfer of

responsibility plan that is intended to assure the continuation of the implementation after the withdrawal of project staff.

Use of the framework in scale up research. From a research standpoint, the implications of the two perspectives shown in Figure 3 for scale up initiatives also provide a framework for scale up research. In doing so, the research implications can be thought of as reflecting the combination of two interdependent parts. The first part is the framework itself and the second part is the instantiation of a scale up application in the framework. In effect, the framework allows a generalizable interpretation of the specific elements of an application which, in turn, comprise the substantive content of the framework. Through this process, the framework provides the means to relate different scale up applications in terms of a common set of dynamics that, in turn, can be the subject of research investigations.

The preceding section which discussed the use of the framework in scale up applications provides a useful approach for considering scale up research. More specifically, this approach is suggestive of scale up research that explores the elements or the combination of elements from the two perspectives. From an instructional systems development emphasis, some examples of such scale up research could be studies that document how to develop effective plans for (a) balancing the number of sites in initial start up against the project resources available for training and support, (b) identifying the appropriate school personnel and their roles as a capacity development goal, and (c) establishing the outcomes of the intervention as an operational "valued added" outcome for the system itself. Additionally, the explicit linkage of each of the preceding to the initial establishment of sustainability and subsequent expansion to new sites would be a valuable research extension.

From a regular research (vs. a research and development) emphasis, each of the elements within the two perspectives could be studied through descriptive, correlational, or experimental research. From the standpoint of descriptive studies, the framework could be used by individual scale up projects to document the procedures and processes they have applied (including how they evolved) in pursuing scale up or to provide a generalizable set of categories on which a set of scale up projects could be surveyed and compared. In addition to descriptive research of ongoing scale up initiatives, similar studies could be conducted on past scale up successes and failures. From the standpoint of correlational research, studies could report the relationships between the occurrence (vs. non-occurrence) of different framework elements and scale up success as defined by the combination of fidelity of implementation and performance outcomes. Some approaches to conducting such research could include either comparisons across different scale up initiatives (including analytic historical studies) or individual projects analyzing the possible role of specific implementation strategies within a scale up domain (e.g., the past effectiveness of intra-project approaches to obtaining collaboration from school personnel across different aspects of the implementation).

From the standpoint of experimental research, the framework could be used to define different aspects of the overall scale up process that could be manipulated to determine their effect on such variables as fidelity, performance outcomes, acceptance of value added criteria resulting from the intervention, the phase in design of the intervention and implementation (re: capacity development), and the transfer of responsibility to school personnel. In conducting such experimental research applications, however, the most inter-project studies would most appropriately be adaptations of multiple baseline designs which focus on replicability of the effects of treatment rather than classical comparisons among groups receiving different treatments. The focus of such adaptations of multiple baseline studies would be whether the introduction of a

specific procedure (e.g. strategy) would have an expected effect on some specified outcome (e.g., greater collaborative involvement of personnel, improved intervention fidelity) when it is applied within a scale up initiative. Ultimately, again from an instructional systems development view, these are the forms of knowledge established through replication that are required to advance the effectiveness of scale up.

In considering the role of the framework more broadly, it is also important to emphasize that investigations of any element within it implies a set of constraints that serve as a useful context for how the findings are interpreted and what methodology is optimal. For example, since fidelity of implementation is an important implementation and outcome variable in scale up, then it is a proper focus of research on scale up and there are a wide variety of methodological approaches for studying it (re: observation, measurement). At the same time, within the context of the framework, an optimal methodology would be to study fidelity in a fashion that could be used practically to monitor it within an ongoing management scale up component. The point here is that just obtaining data per se on different aspects of scale up for research purposes may be useful; but within a scale up project with limited resources, every effort should be made to obtain such data within the scope of the project management component of the initiative.

Some Future Priorities for Scale Up Research

This concluding section will be brief because it is a logical extension of the preceding one. The major point in considering priorities for scale up research is that they should advance knowledge in areas that are useful to enhancing the success of scale up initiatives. In doing so, the examples in the preceding section from the areas of instructional system development, descriptive research, correlational research, and experimental research are illustrative. At the same time, although it is important to recognize as an important criterion for scale up success the research verification that an intervention undergoing scale up does produce an intended performance outcome, such research is not scale up research per se. Rather, given the performance outcome obtained, the purpose of scale up research is to document and explain why such outcomes resulted from the implementation. In turn, particularly from an instructional systems development perspective, research on performance outcomes obtained through implementation of a validated intervention must be first be linked to fidelity of implementation, which, in turn, must be linked to the dynamics (e.g., training, support, management) that resulted in the intervention being implemented. In fact, that is a major function of the framework presented here. Without maintaining such a form of contextual focus, the results of such research are highly limited in terms of the degree to which they can inform the practice of scale up. And, of even greater importance, is that the methodological focus of scale up research should be on the elements of the scale up process itself, considered within that context, rather than on elements explored in isolation.

Within the possible scope of the framework for scale up research presented here a number of representative topics can be identified as major priorities. And, in doing so, it is important to recognize that most (if not all) can only be addressed with ecological validity when they are part of an ongoing scale up initiative. With this constraint in mind, a major need in advancing scale up is to gain a better understanding of how to establish the “value added” by an intervention to an institution in such a way that is itself systemic. This is a problem we are working to address in our own IERI project whose outcomes are well beyond the institutional assessment systems in place. But this is a much broader issue than just assessment (although assessment is a key element) and involves a number of other aspects (e.g., principal advocacy, visits to project schools by central

administrators, comparisons of student work in project and non-project sites). In any case, if the "value added" by the intervention cannot be made part of the institutions expectations, then sustainability of the implementation is not likely to occur.

A second major need in advancing scale up is to apply an instructional systems development framework to analyze the dynamics of past and presently ongoing scale up projects. This is important for no other reason than most scale up initiatives are conducted by original researchers whose expertise is not in the area of instructional systems development that provides a logical foundation for developing the comprehensive capacity needed for scale up. Using the present framework to analyze such projects would result in a number of possible outcomes. First the results of such an analysis would provide a patterned status report regarding the state of scale up research initiatives that would be important from a policy standpoint. Second, such analyses could identify possible strengths and weaknesses in present scale up designs that, in and of themselves, could be of value to enhancing their success. For example, not addressing the question of "added value" could result in a failed scale up initiative, no matter how much benefit the intervention added to the institution. And, third, the results of such an analysis could provide the beginning of a needs assessment of the forms of assistance and support that, if provided, would advance the potential success of scale up initiatives. In turn, such findings could be used as specifications for computer-based consultive (expert) systems that could be used to provide an interactive tool in support of scale up design, planning, management, and evaluation.

Given the overall framework presented in this paper, scale up research can be approached from a general methodological perspective through which substantively different scale up interventions can be studied and related. As a result, the framework provides the means through which findings relating to scale up obtained in one scale up application context can be interpreted and applied to others. On one hand, the framework provides a general context for planning and conducting scale up applications that identify critical elements that must be addressed. On the other hand, the framework can be used as a general means for identifying possible scale up research initiatives and then relating the subsequent research findings to a wide variety of scale up applications. Although an initial start, the primary goal of the framework presented here is to help insure that the focus of scale up research is, in fact, on scale up itself and that, as a result, greater understanding of the scale up process itself is gained. In turn, as such research on scale up evolves, it is expected that the framework presented in this paper would evolve with it.