A New Tool for Front End Analysis to Improve Performance in Organizations: Lessons Learned from Movement Programming

Running Head: New Tool for Front End Analysis

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Abstract

Diverse organizations present new challenges when designing change and performance interventions. Traditional tools may not be adequate to identify issues and suggest solutions. Turning to other fields, we may discover useful new tools. Herein, an evidenced-based model for developing exercise programming, the Holistic Approach to Developmental Movement Education (HADME), which has proved to be useful in case studies involving athletes who seek to optimize movement is presented. The co-author, an instructional designer, considers application of the model as a tool for analysis of performance problems in organizations as well as the development and evolution of interventions to optimize organization performance. The HADME model provides a tool for viewing activity of a complex system and suggests holistic approaches to developing more optimal interventions. In this paper, the HADME model is explained, its application to optimize performance issues in organizations is considered and an anecdotal case illustrates its potential.

Keywords: performance analysis, movement programming, instructional design, systems thinking

Overview

A Design Intervention

To develop new tools for analysis and intervention for diverse organizations, fields as diverse as architecture (Alexander, 1979), engineering (Petroski, 1992) and product design (Norman, 2003) have proven useful. In this paper, we explore a case that draws inspiration from the physical sciences.

In 1968, biologist Ludwig Von Bertlanffy proposed the general systems theory to explain complexities of biological organisms, providing an elegant explanation of the features related to a self-organizing and complex system. Considering the emerging features of a system as a result of the contribution of all of its individual parts, scientists are better able to measure, describe and predict patterns of the system (Von Berlanffy, 1968).

Similarly, when designers seek to improve performance of an organization, our designs can be more effective when we consider the entire organization (Eason, 1988). When we do not, we risk solving the wrong problem or creating other problems when implementing our solutions in isolation. Utilization of a system or holistic view during front end analysis can highlight inter-dependencies and suggest performance improvements.

Utilizing views of instructional design, learning science and exercise science, a systems-based tool, HADME – Holistic Approach to Developmental Movement Education, was developed for designing human movement interventions. We offer a case study where this tool was used in front end analysis and development of an intervention for a multi-faceted organization.

Descriptors and Definitions for Clarity

To compare and contrast exercise programming and instructional design, we will use the following descriptors and definitions.

1. Movement education – interventions designed to resolve a specific movement issue including coaching, physical therapy, and more.
2. Athlete – an individual taking part in a regular exercise program.
3. Performance improvement – activity within a workplace.
4. Worker – can be a process, a person, a group of people, a team and/or an organization.

Underlying Assumptions

We use the following assumptions:

1. Best effort - In both domains, we assume that the activity is the actor's best effort to solve a problem, based on their knowledge, skills, and experience. (Weick, 1995)
2. Systems view - When viewing the body or the organization, we find it most useful to view the point of interest as a part of a system.

Traditional Exercise Instruction versus Holistic Movement Education

Before applying the HADME approach to instructional design, we must place it within the context of movement education.

A holistic approach to movement education considers the individual's body as a complex system with strength and skills of one part of the body affecting other parts (Thelen & Smith, 1996). For example, when doing a leg press, a holistic movement educator would consider the positioning of the back, pelvis and legs in addition to the level of muscular fatigue. In contrast, traditional exercise instruction suggests gains in skill and performance occur incrementally through repetition, practice, and coaching. (Winstein & Schmidt, 1990). Holistic

theory sees movement evolving differently for different athletes with non-linear gains (Latash, 2008). This contemporary view has provided the framework to develop new tools (such as HADME) for analysis leading to more effective movement education.

Concepts of Holistic Movement Education

Thelen and Smith (1996) propose that each athlete's attempt of a movement will be unique, based on their knowledge, skills, and experience. It is important to consider *all* things mental, emotional, perceptual and physical which affect movement performance. Postulating that movement and improvement varies for the whole system (each individual) provides meaningful insight into how movement can be analyzed and instruction developed.

Interventions that consider the individual instead of a "generic" pattern will promote non-linear gains of the athlete that occur in a manner that is individually appropriate. Successful programming for a human system must be sensitive to the athlete as a system as well as the dynamics occurring between the athlete and the movement educator (Polsgrove, 2012). Design becomes a process, developing ways to maximize the system through increasing the efficacy of subsystems and integrating the increased efficacy into the whole system. For example, when doing a leg press, having the athlete focus on keeping the left knee aligned with their foot may result in an *initial* reduction in force. However, once the new pattern is integrated, gains in power will show.

Introduction to Holistic Approach to Developmental Movement Education

Traditional approaches look to specific performance outcomes – how much weight is lifted. Underlying skills (i.e. how to walk, run, throw) are assumed. (Cleland, Mueller & Gallahue, 2017; Gallahue, Ozmun, & Goodway, 2012). The result is often that athletes must

rely on inefficient movement skills throughout their lifetime (beyond first steps, walking is not taught.). When faced with a movement issue, such as pain in a joint, athletes do not know how to correct the cause and often develop compensatory patterning that complicates issues of inefficient movement. Before learning correct basic skills, this incorrect compensatory patterning must first be unlearned. Even when a new movement is taught, the old, preferred patterning, remains the "go to" response in times of heavy physical exertion or physical stress. Similarly, organizations will often return to old, inefficient behaviors during times of stress.

The *Holistic Approach to Developmental Movement Education (HADME)* model is a programming method developed to enhance overall system performance by focusing on the optimization of subsystem performance. (Polsgrove, 2008; Polsgrove, 2012; Polsgrove & Lockyer, 2018).

Figure 1 provides an overview of the model. At it's core, HADME provides a tool for analysis and development by utilizing a systems view of the body where non-linear improvements in athletic performance can be expected. On the left is a general or macro view. On the right is a Phasic or meso view. The three *levels* of the model, top to bottom, represent both analysis and design processes. The linear presentation of the model is a literary device to make initial understanding of an iterative process easier.

[Insert Figure 1.]

Column One – Overview / Macro

I. Evaluation of the current system

The first goal is to identify intra-relationships of subsystems. While identifying the significant features, attention must be paid to how those features relate to the overall organization of the body/system. The movement educator seeks to identify the primary systemic features that may be contributing to non-optimal performance both in subsystems and the overall system.

For example, for an individual complaining of foot pain, consideration should also include related subsystems such as tensions in the hip, back, and even the shoulders that affect the way the foot is held and used which contribute to the foot pain.

II. Programming

Guided by this evaluation, the movement educator considers options of subsystem utilization that may minimize limitations or enhance the freedoms of the body/system. Once a potential solution is identified, the movement educator will simultaneously guide the athlete through identifying the best version of the "movement solution," as well as assessing its impact on the performance of the body/system.

III. Identification of More Optimal Patterning

Finally, the athlete applies the new programming solution of movement. A movement solution is readily utilized to establish more effective patterning of the system. In addition, both athlete and movement educator continue to seek, identify and increase opportunities for further applications of the solution in an ongoing cycle of improvement.

Column Two – Phasic / Meso View

For those designing instruction or exercise, one may think of the macro column as *what to do.* The meso column is *how* to do it. As with the macro column, the phases of the meso view

do not need to proceed from beginning to end in a linear fashion. Knowledge gained in one level leads to a deeper understanding in preceding or succeeding levels.

I: Scoping

During *scoping,* the educator looks for details in order to develop a mental model of the athlete's systemic organization. The process begins as the educator informally assesses the movement and vigor of the athlete during light activity. Through this interactive process, the educator confirms or adjusts observation through feedback, ehancing communication between educator and athlete.

The educator next seeks to identify significant attributes that influence systemic organization of the athlete. Common areas of inquiry include pain, symmetry of body and movements, comments and sounds uttered, tension, and posture during and after movement. Physical and emotional attributes are noted, including both those that encourage and discourage optimal movement performance. The movement educator can draw out information from athlete reflections, gaining more information, clarifying understanding, and building communication for further feedback by the athlete. Experienced instructional designers can gain similar essential information when they observe and interview workers within an organization.

Consider a sales representative who drives long distances and now complains of pain in the neck and lower back. Such comments can define systemic attributes. To identify physical and emotional aspects that contribute to the subject's overall painful body organization questions might include: asking the sales representative (athlete) to perform stretches to determine hip mobility, asking for more detailed description of the back pain (i.e. point of

origin, path, timing, intensity) or assessing postural alignment and ability to stand or sit with different postures.

In summation, during the meso view, *scoping* level, the movement educator works with the athlete to identify the systemic organization, which includes features that optimize performance as well as those that are non-optimizing. In this joint process a model of the athlete's body as system is constructed, representing the inter-related subsystems and a meaningful method for facilitating movement alteration and athlete feedback. To improve, a "tool" (a new way of accomplishing a movement task) is needed.

II: Tooling Phase

A better understanding of the current organizational state of the system, an intervention prompting a shift to a more optimal state is developed. Working together, educator and athlete develop a "tool" for systemic change. This tool is typically an internal action by the athlete that prompts a systemic shift in body organization, such as engaging the abdominal muscles before doing a leg press, increasing thigh tensions allowing more forceful contraction and increased resistance. Tools may eventually be used to shift other patterning. Once an effective tool has been initially identified, the educator and athlete work together to test and improve its effectiveness. Fostering a continued understanding of the body as system, the athlete's awareness of the cause/effect relationship between bodily control and movement efficacy grows, encouraging feedback to continually improve the effectiveness of the tool. Success is measured by athlete's use of more optimal movements, using the tool(s) and continuing to optimize task performance by adjusting the system through *ongoing* tool modification. This is essential, because as tools become established, the system will change, so new tools will have to

be developed and old tools will have to be adjusted to accommodate the new interactions within the body/system.

Returning to the example of the salesperson with chronic neck pain, tooling might proceed as follows. Hypothesizing that poor posture from weak back muscles and tight hamstrings directly impacted driving posture which created neck and low back tension, the educator believed that more optimal systemic organization could be achieved by the tool "a more effective posture" through increased muscle engagement. To test this tool, the educator has the athlete (the salesperson) perform a leg press while utilizing upright versus a slumping posture. The athlete is able to press the weight more efficiently when using the tool, indicating a stronger hip placement. Using the tool, the athlete performs several exercises to improve back muscle engagement. Strengthening of the leg muscles follows. This synergistic connection incorporates the tool as part of the body/system, as well as alleviating neck tension. By viewing the body as a system, a problem with the neck is corrected by addressing the poor back and hamstring imbalances, rather than introducing neck exercises.

As the understanding of the tool and how it impacts and optimizes the body/system, over time, the athlete will begin to see opportunities to apply the tool in additional situations. Learning about the body as a system increases the efficacy of the tool.

III: Applying

This level focuses on developing new tools and implementing existing tools in new situations, correlating to transfer in ID. To successfully transfer a movement tool, the athlete uses self-regulation when applying existing tools and applies the tool in new and more advanced applications, be they new exercises or new activities. Through repetition the athlete learns to

apply both tools and mental modeling in their efforts and the movement educator takes a lessor, advisory role (Mosston & Ashworth, 2002). Thus, through a routine of practice, reflection and application, the ability to effectively use the optimizing tool gradually becomes internalized and part of the athlete's evolving system.

Returning to the sales representative, understanding how to use postural alignment through more engaged back muscles will elicit a more optimal movement pattern in the leg press as well as the chest press. The habitual use of this tool in a variety of tasks will encourage a more optimal driving posture. In *applying*, the sales representative uses this more optimal posture when carrying heavy bags and other physical activities.

From Movement Education to Instructional Design

An important epistemological concept shared when transferring the HADME model to performance improvement or instructional design (ID) is that an individual and an organization can be seen as complex systems. When analyzing an organizational issue, it is useful to consider the performance of sub-system(s), that exist within a larger system of a complex organization instead of a pinpointed "problem" with a person, small group, or specific activity (Eason, 1988, Senge, 1990), understanding that an adjustment to one subsystem will affect other subsystems. HADME provides a useful means of unpacking these interactions.

Organizational Overview – Macro View

At the *macro* view, a designer considers the events and patterns of an organization as representing the complex interaction between its various sub-systems while *evaluating* the current system. The goal is to identify potential solutions to optimize functioning of the organization/system.

Organizational Overview – Meso View

I. Organizational Scoping

During s*coping* level of analysis from the meso view, it is useful to consider an organization from two types of subsystems. The first type are *impact* task-based subsystems or those that have influence the performance on other sub-systems. In most organizations, these systems include: **Skills** or knowledge of workers, **Information** access, **Rewards** and demotivators, **Communications** systems and procedures, **Overlapping** or competing systems, and **Measures** of success/failure (mnemonic is Sir.Com). The second type of organizational subsystems are *physical* task-based organizational subsystems. For example, in a repair shop, task-based subsystems include inventory, trouble shooting, repair/replace decisions, receiving, and shipping.

As the designer builds a mental model of the organizational processes, seeking subsystems where change can have the greatest impact on performance, it is crucial to continue to seek insights from workers. Through observation and interviews the designer needs to identify best solutions from perspectives of multiple individuals. Useful questions may include: What task(s) takes most of your time? Given a perfect world and an unlimited budget, what would you change? What procedures or activities slow you down the most...the most often? While asking these questions, the ID is not only seeking information, but is also seeking motivators and demotivators, frustrations, and communication and information flows. In addition to identifying the outstanding features of an organization, workers/informants may identify unofficial shortcuts they have developed to improve performance which, if officially allowed, will boost productivity.

In addition to the designer building a mental model of the organization from these insights, such information may become an important part of *evaluation.* Identifying impediments and how such impediments slow processes, the means to measure systemic improvements are revealed.

II. Organization Tooling

The *tooling* level insights grow from the insights gathered during *scoping*. Having developed a mental model of the processes, the effort turns to identifying subsystems where change may have the greatest impact on performance of the organization/system. At this level, it is crucial to continue to seek feedback from workers, as change in one sub-system often creates unexpected shifts in performance of another sub-system of the organization. Workers can often identify problematic inter-dependencies.

Tools in the case of an organization may include training, change in means and methods of information access, change of work processes, changing communication channels, adjustment of rewards, and changing of measures of improvement.

As an organization is a larger system (than a single individual) and implementation involves groups, time and resources, time taken to ensure the effectiveness of change initiatives before implementation is time well spent. As such, during this *tooling* level of design, small test implementations are recommended, to identify impacts expected and unexpected, and to further develop communication between worker and designer. During such interactions, additional or alternative tools may be proposed, where the designer shows very rudimentary models of proposed changes seeking feedback, considering alternative solutions, strengths, weaknesses

and stated preferences for solutions. This may uncover new and more efficient solutions and increase buy-in, which aids implementation.

III. Organization Applying

As the change initiatives are fully implemented in the *applying* phase, returning to the *scoping* phase is important, seeking unexpected effects on inter-related subsystems. Workers will often be the first to notice improvements and impediments. *Applying* must be an interactive processes between designer and workers.

As the implementation is rolled out, improvement based on measures delineated during the *evaluation of the current* system can be monitored and celebrated. As the organization transfers the tools developed and implemented from the HADME process, the organization begins a cycle of self-improvement. A proper acronym for designers is HA**PI** (Holistic Approach to Performance Improvement). However, in this paper, we will continue to use HADME for continuity.

A Case Study

HADME was used for front end analysis for design of a performance intervention. An organization providing group homes, helping bridge the gap from homeless to permanent housing solutions wanted a training for a cloud-based data collection system. This data collection was essential for funding, but workers in the houses were inconsistent in filing reports with quantity of reporting ranging from detailed and accurate to no reporting at all. Quality was also inconsistent within each site as well as between sites. Central management of the agency identified the problem as a lack of staff knowledge and wanted a training course for workers to correct these irregularities.

Starting with HADME's *evaluation of the current system,* the agency was analyzed as a system comprised of multiple subsystems (houses). Each house was had a variety of subsystems including staffing, scheduling, onboarding, training, teaching, and coaching clients (some handled by the agency, some by each house), communication (between workers), maintenance, daily chores, and special issues (incidents with or between clients).

To establish a framework for developing a mental model, features of subsystems of both agency and individual houses were detailed looking at Skills, Information, Rewards, Communications, Overlap, and Measures of success (Sir.com).

Interviews with workers and observations were carried out at four of the eight houses as well as at the central office and a working mental model was developed. The most significant observation was the irregular workflow was within each house. Unexpected flurries of activity were often followed by periods of relative quiet. While certain activities (entry or exit of a client) required expected effort, many situations could not be predicted. There was no "typical" day. Workers often had to solve issues in new situations with no forewarning. Dedicated workers, they adopted personal measures of success (as well as the perceived mission of the organization) that focused on client support. Data collection, while understood to be important, was not given a high priority.

Given a choice between meeting client needs and recording data, the clients came first. Most workers understood how the online system worked although the coding of efforts and incidents were areas of confusion (exacerbated by changing codes and unclear definitions). No one could remember an instance when they had questioned other workers regarding coding issues. One laughed when this was suggested. When asked if training might be needed, no one

agreed that training would be helpful except for new hires. When asked to demonstrate the data collection system, none of the workers had difficulty. Some was frustration voiced when the designer asked workers to code various incidents. There was uncertainty over which codes to use, but getting the codes "right" was view as an unimportant task.

Using the mental model developed in the *evaluation* phase, the designer moved into the *programming* phase working to create a tool that would support systemic change in performance. The evaluation phase indicated that the problem was not due to a lack of skills. However, the process of data collection was not integrated into any other subsystems/activities within the houses. Instead, it was viewed as a separate, additional task. Merely recording an incident at all was viewed as success. The workers also felt the agency cared more about the quantity of data than accuracy of coding, since they were only remonstrated if they posted no data.

To help optimize the performance of the organization, the designer felt a tool that would have the greatest impact for increasing quantity and quality of data would be a rewards program. The problem with accuracy and consistency of data could be addressed through new measures of success and through information sharing, particularly if the information sharing could be made to be part of the workers' daily routines as opposed to an additional chore.

Looking at data collection as a subsystem of the houses, which were themselves, subsystems of the organization, the inconsistent collection was not intentional, nor due to lack of motivation. The issues were prioritizing data collection and providing communication tools for clarifying questions about coding. In second interviews with workers, a knowledge sharing system that focused on coding issues and solutions was suggested. When asked if this would

help, respondents indicated that it might be nice, but would probably not be used, as their biggest issue was lack of time. With this feedback, the shared mental model was refined to identify that in the current system the data collection process was viewed as an additional task to a busy job. It was not highly valued and quantity was valued over accuracy.

Considering how to integrate knowledge sharing into the daily routines (sub systems) of the houses, the designer asked how houses were kept abreast of changing organizational information. A daily email met general needs, with phone calls for more immediate issues.

Based on this information, the designer proposed a variety of system optimizing tools (interventions) including:

- Web-based portal. A "news of the day" section would take the place of the daily email alerts. As this information was necessary for all workers, putting it on the portal would drive eyes to the portal.
- Reporting and rewards system for quality *and* quantity of data. Regular posting of usage statistics would elevate the importance of data reporting as a measure of success for houses and the organization. Small rewards for consistency, quantity, and depth of posting on a monthly basis was proposed.
- Online Q&A forum concerning "new understandings" for coding. Management commitment for fast and consistent responses. Lauding questioners while providing answers would provide further shared knowledge and encourage clarification requests. This area would be referenced regularly in the "news of the day" section and be prominently displayed on the front page of the information portal to encourage participation.

Based on the HADME analysis, training was not identified as a need. Instead, the tools/interventions were communications and rewards based. These interventions were significantly more cost effective in worker time and development cost and had a greater potential for impact than the initial solution the ID was asked to provide.

The *identification of more optimal patterning* overview, where the changes to the system and new system organization lead to further insights and growth of individuals and the system as a whole continued after the designer's contract ended. By creating an easy and accessible means for communication regarding codes, tools for increased communication and creating shared understanding was in place and being used. These tools were available to be used for other issues within the system. This allowed the system to continue to evolve, growing as the shared understandings led to further changes within the organization.

Summary

Whether the goal of a task is to improve athletically or to improve performance within an organization, we all adopt strategies for modifying our performance in the hope of making significant improvements. Typically, the first strategy for improvement is to strengthen resolve. Skilled actors frequently see great benefits from regular practice and increased effort. The crucial word here is *skilled* actors. Once an optimal movement has been established, diligent repetition reaps robust rewards. For the *unskilled* actor or organizations that lack the perspective to envision the inter-related complexity of systems and sub-systems, practice and increased effort do not make perfect. Relying on sub-optimal patterns will likely reinforce those ineffective patterns, increasing frustration, and decreasing motivation and efficacy.

Viewing the body or the organization as a system made up of subsystems provides a useful path for development of tools for improving activity. Implementation of a new optimizing tool requires time and focused practice until new habits become established and eventually become the preferred patterning. In times of stress, athletes and organizations must resist the inclination to return to inefficient habits. Continued interaction between athlete and educator or designer and worker helps. Observing and interacting with workers during these stressful time also facilitates utilization of more optimal habits.

The designer viewing activity as work by subsystems within a larger, complex system is able to offer analysis and interventions that optimize performance. As more optimal actions are developed and applied, a fading of non-optimal activity should result. Through such efforts, the body or the organization can function more efficiently and effectively. This shift provides its own motivation to the athletes and workers, who now have the ability to apply and improve self-regulating tools to continue to continually improve their actions.

The goal of the HADME is for the athlete or worker to understand how to adjust the system to meet the requirements of the current task and then to generalize that knowledge to other tasks. Through greater awareness, appropriate strategies can be adopted that promote optimal individual, team and organizational performance. The lessons learned from application of the HADME to movement programming may be applied to organizational performance issues, providing the instructional designer with a valuable tool for analysis and development of performance interventions and change initiatives. Viewing the organization as a complex system with interacting subsystems allows for a more realistic view of obstacles and paths to improvement. The HADME provides the athlete and the organization a tool for self-reflection

and improvement. This allows improvement to become an ongoing activity instead of a special event.

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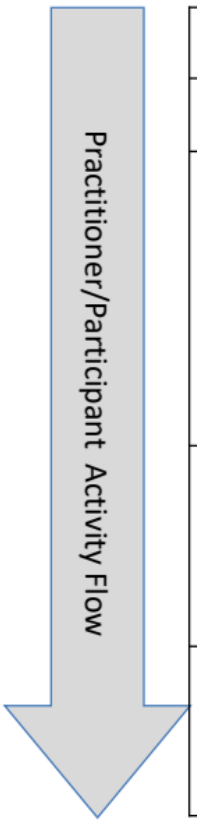
Figures



Overview	Phasic
(General)	(Specific)
I. Evaluation of Current System	I. Scoping *Evaluation of the system* • Pain • Symmetry • Comments • Unusual sounds • Constant tension in range of motion • Natural posture
II. Programming	II. Tooling *Interaction of Sub-Systems* • Rules of performance • Strategies • Mental models (tools) of practice
III. Identification of More Optimal Patterning	III. Applying *Reorganization of System* • Gained understanding • Reduced compensation • Rapid gain in strength

Figure 1. The Heuristic Model of the Holistic Approach to Developmental Movement Education