Front-End Analysis Tool: Dr. Thomas Gilbert's BEM

Donald A. Petrie

IDD&E, Syracuse University

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Professor Rob Pusch

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Introduction

The study of Human Performance Improvement (HPI) focuses on the development of interventions, which permit humans to close performance gaps occurring within the workplace. Further, HPI not only serves to recognize problems within the workplace, but to analyze the cause of the problem, develop strategic intervention protocols, and to thoroughly evaluate these interventions to identify successes and potential negative consequences of intervention implementation (Dalto, 2020). Ultimately, the goal of HPI is to create meaningful performance improvements and Dr. Thomas F. Gilbert's development and introduction of the Behavior Engineering Model has played a vital role in accomplishing this goal (Dalto, 2020).

BEM Overview

To provide a thorough overview of the BEM, selected as the topic of this project, this writer will elaborate on several perspectives of Dr. Gilbert's Behavior Engineering Model (BEM). Further, this section will serve to explore the purpose and origins of the BEM as well as the information it is used to collect. Lastly, this writer will elaborate upon the context of the BEM, as it pertains to this project, and provide advantages and disadvantages regarding the use of the Behavior Engineering Model.

Purpose

The BEM, developed by Dr. Thomas F. Gilbert in 1978, focuses on two specific factors of performance including the individual's behaviors and the environment in which the individual is expected to perform (Weebly, 2021). Further, Gilbert posits that these two factors may be viewed from three differing perspectives including information, instrumentation, and motivation (Weebly, 2021). Application of Gilbert's BEM to performance problems serves to gain an understanding of potential influences on behaviors while also working to identify methods to improve performance.

Selection Rationale

Selection of the BEM to negotiate performance problems provides the analyst or instructional designer with methods for diagnosis of the problem(s) and for the design of solutions. Further, progressing through the BEM will allow users to survey the case of interest,

from multiple perspectives, while investigating several different situations that may serve as the cause for the problem. Flexibility and adaptability also serve as attributes of the BEM, as users maintain the ability to add or subtract various portions of the model to best fit their specific situation. This is exemplified in the case study of choice for this project, where the analysts decided not to investigate the motivations of neither the environment nor the individual, explained in the Example of BEM Application section of this paper.

The BEM engages analysis through both individual and environmental perspectives and analyzes potential informational, instrumentational, and motivational causes. According to the BEM, analysts should focus on the data produced by, and the resources and incentives provided by, the environment and the knowledge, capacity, and motives retained by the individual to completely assess problematic situations. Ultimately, the BEM provides a flexible, adaptable, and comprehensive front-end analysis tool, designed to provide users with multiple perspectives. These attributes make the BEM an excellent choice for the investigation of a wide range of human performance problems.

Origins

With the publication of Gilbert's book, Human Competence: Engineering Worthy Performance (1978), the BEM became a model used throughout the field of human performance technology (HPT). In his book, Gilbert explained his "three leisurely theorems" designed to elicit the idea that these theorems may be applied, across time, for individuals to change a behavior, ultimately resulting in a more desirable performance outcome (Gilbert, 1978). The third of these theorems, labeled by Gilbert as the management theorem, elaborates on the methods used to diagnose and engineer individual behavior, thus producing exceptional performance (Chyung, 2005). Gilbert's third leisurely theorem became what we know now as the Behavior Engineering Model.

The three theorems, the worthy performance theorem, the measurement theorem, and the management theorem all resonated throughout the field of HPT, but Gilbert's BEM became a widely accepted and often utilized tool in the field of front-end analysis (Chyung, 2005). The BEM allows users to view the problem from informational, instrumentational, and motivational

perspectives while applying these lenses to both the individual and the environment, as depicted in figure 1. Lastly, Gilbert proposed the idea that behavior does not equal performance, but environmental factors such as data, resources, and incentives gained by the individual from the environment are more impactful on behavior than internal individual factors like knowledge and intrinsic motivation (Winter, 2018). Ultimately, the information collected with this model assist in finding the cause of the identified problem while also providing alternative perspective that may serve towards the creation of inventive solutions.

Information Collected

As previously stated, Gilbert's BEM collects information from the three perspectives of information, instrumentation, and motivation while focusing on the realms of the individual's environment and the individual themselves (Gilbert, 1978). From the information perspective, the BEM collects environmental data including feedback about the level of the performance, performance expectations, and existing guidelines focused on desired performance. On the individual level, informational collection focuses of individual knowledge and how systematic training matches high-level performance requirements and individual placement within the performance environment (Gilbert, 1978).

The instrumentation perspective focuses on environmental resources including available tools, time, materials, and other resources available to match the desired performance needs. Instrumentation also investigates the individual's capacity to properly schedule performance to match peak capacity, the ability to utilize physical aids such as graphic guides and adaptive technology, and the proper selection of instruments to enhance performance (Gilbert, 1978). Lastly, from the motivation perspective, the environment is investigated to ascertain available incentives such as financial rewards, non-monetary incentives, and opportunities for development based on high performance as well as consequences resulting from poor performance. Individual motive information is also collected through the BEM including the individual's assessment of other people's motivations to perform and the recruitment of the proper individuals to match situational realities (Gilbert, 1978). Figure 1 displays Gilbert's BEM and provides his developed quadrant chart of individual and environmental factors.

	Information	Instrumentation	Motivation
Environment	*Data* 1. Relevant and frequent feedback about the adequacy of performance 2. Descriptions of what is expected of performance 3. Clear and relevant guides to adequate performance	*Resources* 1. Tools, resources, time and materials of work designed to match performance needs	*Incentives* 1. Adequate financial incentives made contingent upon performance 2. Non-monetary incentives made available 3. Career-development opportunities 4. Clear consequences for poor performance
Individual	*Knowledge* 1. Systematically designed training that matches the requirements of exemplary performance 2. Placement	*Capacity* 1. Flexible scheduling of performance to match peak capacity 2. Prosthesis or visual aids 3. Physical shaping 4. Adaptation 5. Selection	*Motives* 1. Assessment of people's motives to work 2. Recruitment of people to match the realities of situation

Figure 1. The Behavior Engineering Model (Thomas F. Gilbert, "Human Competence: Engineering Worthy Performance," 1978)

Context

The context in which the BEM may be employed is vast and nearly unrestricted as the BEM is viewed by many as foundational within the HPI field of study (Winiecki, 2015). Through adaptation and exploration of the specific problem, opportunities for beneficial use of the BEM are nearly limitless. Once a performance problem is identified, the BEM, at a minimum, allows users to view the problem from multiple perspectives while focusing on the two major factors involved in workplace performance issues, people and their environment. All performance problems arise from a needs assessment, which informs on the need to close a particular performance gap. Once complete, and the need for an intervention is realized, a front-end analysis (FEA) of the performance gap is required. This FEA may be conducted in a variety of ways utilizing countless methods, models, and tools of which the BEM is merely one.

Advantages

The advantages of the BEM are substantial, as reflected by its wide acceptance and use in the HPI field. As previously mentioned, with slight modification the BEM can serve countless applications focused on closing a performance gap.

- **Adaptable:** The BEM has been proven, through historical application, to be of service to countless HPI situations. By simply modifying the emphasis on the key analysis topics included in the BEM and removing or replacing those that do not apply to the situation, analysts can gain benefit from use of the BEM in most situations.
- **Dual Realms:** The BEM focuses on both the individual performer and the environment in which they are expected to perform. Through evaluation of these two realms, analysts can make connections, discover additional contributing factors, and gain a deeper understanding of the performance problem and it associated causes. Further, the causes discovered may have not been realized until analysis of both environmental and individual realms has been completed.
- **Varying Perspectives:** Within the realms of the individual and the environment, the BEM focuses on three perspectives, information, instrumentation, and motivation. By applying these lenses to each realm, analysists gain the ability to understand how environmental data, resources, and incentives, as well as individual knowledge, capacity, and motives influence the situation and contribute to the identification of performance problem causes.

Disadvantages

While the BEM possesses the capability of broad and far-reaching application to HPI situations, it also possesses some disadvantages.

- **Shifts Focus:** The BEM was designed to examine the individual and the environment, but other perspectives may require investigation as well. Processes occurring within and around the individual's environment are capable of heavily influencing the performance problem, but are not specifically addressed by the BEM (Winter, 2018). While the BEM does provide varying perspectives viewed from separate angles, there may be factors contributing to the performance problem that are simply left out of this model.

- **Susceptible to Misinterpretation:** Misinterpretation of the BEM is common, especially amongst novice analysts. The BEM is designed to gauge an understanding of humanistic functioning within, and due to the influence of, an environment. According to Jeffrey Dalto (2020), inexperienced HPI analysts may begin analysis with the belief that the problem is due to either the individual or the environment and only utilize that specific portion of the BEM during analysis, focusing solely on the individual or the environment, as opposed to both. This situation may become problematic as it results in "tunnel vision" and may cause the analysist to overlook a valuable perspective, which could potentially lead to discovery of the problem's cause (Dalto, 2020).
- **Behavior Centric:** The BEM is rooted in behaviorism, and thus requires a behavioristic approach to understand, utilize, and gain benefit from its use. While knowledge is a factor of the BEM, the internal processes of cognition and decision making are not fully explored.

Example of BEM Application

The example of BEM application that this project focuses on is the context of workplace injury rates at an ice cream plant supporting large grocery retailer, as derived from Dr. James D. Rethaber's case study: Bridging the Performance Gap with Ergonomics. High rates of work-related injuries, such as sprains and strains, led to several Occupational Safety and Health Administration (OSHA) injury investigations within the ice cream plant (Rethaber, 2011). In response, the plant's safety staff employed a firm that specializes in workplace ergonomics. The firm sought to conduct a FEA of the performance issue through the utilization of Gilbert's BEM (Rethaber, 2011).

Environmental Analysis

Application of the BEM led the investigating firm to discover that several potential problem causes existed within the environment. Analysis of environmental data indicated that workers within the plant rarely received constructive feedback regarding their posture or body mechanics while performing work requiring physical exertion. Upon analysis of environmental resources available to workers, it was discovered that the tools and workstations provided to the workers were inadequate, exemplified by wet and slippery work surfaces, lower than optimal

workstation heights, and repetitive work function without proper employee rotations. The firm, however, did not conduct an environmental incentive analysis in accordance with the BEM, as it was deemed not applicable to the situation (Rethaber, 2011).

Individual Analysis

Upon analysis of the individual workers within the plant, the firm discovered potential contributing factors to high injury rates in both individual knowledge and capacity. Once again, individual incentives were not analyzed as the investigating firm found this perspective to be non-applicable. Regarding individual knowledge, workers were not trained on proper body position during instances of manual labor including lifting, pulling, carrying, or pushing heavy loads. Analysis of individual capacity indicated that workers had no access to illustrative job aids that could provide reference for proper positioning and manual labor activities (Rethaber, 2011).

Intervention Selection

Through utilization of the information collected from the application of the BEM, the analysis firm made several intervention recommendations. To address the data cause, floor supervisors received training on the identification of improper body positioning during instances of manual labor. Interventions focused on resources included modification of tools, installation of slip-resistant flooring, job rotational schedule implementation, and redesign of employee workstations (Rethaber, 2011).

Individual interventions focused on knowledge included the development, design, and implementation of a job-specific training program and the creation, distribution, and display of job aids explaining proper manual labor body positioning (Rethaber, 2011). Ultimately, the implementation of these interventions, designed from the discovery of contributing injury factors through the application of the BEM, resulted in dramatic decreases to plant injury rates. Work-related strain and sprain injuries reduced by 86% while OSHA recordable injuries were reduced by 90% (Rethaber, 2011).

Critique

This writer's opinion regarding Dr. Rethaber's case study is that it serves as a quality example of the BEM in action. While simple analysis of individual worker performance may have contributed to some decrease in workplace injury, the environmental perspective provided by the BEM surely enhanced the efficacy of the designed interventions. Further, the systematic approach to implementation of the BEM in this study resulted in a thorough and complete analysis of the entire situation, leading to multiple interventions. Ultimately, aside from the non-explored incentives and motives, the combination of environmental and individual analyses and the implementation of several associated interventions nearly eliminated all injuries within the ice cream plant.

Conclusion

The BEM is a valuable, diverse, flexible, model that can be used in nearly any HPI situation. Further, BEM use results in the discovery, and opportunity for analysis of, problems originating from several varying perspectives. Due to the wide use of the BEM since Dr. Gilbert's publication of Human Competence: Engineering Worthy Performance (1978) across the HPI industry, the BEM has proven to be effective, useful, and reliable when applied to various performance problem situations. Ultimately, the BEM provides analysists with a comprehensive method for exploring performance problems and designing interventions to close performance gaps, with consideration to individual performers and performance environments.

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