Toward a Framework for Project Management Information Systems Training

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ABSTRACT

Organizations are increasingly using specialized software systems to enhance the management of projects, programs, and portfolios. Training delivered within the professional workplace has been well-documented as effective and widely used. However, previous research that examines Project Management Information System (PMIS) training has been limited. This paper proposes an empirically-derived multi-dimensional framework to facilitate improved planning of PMIS training initiatives, advanced measurement of PMIS training outcomes, and enhanced understanding of PMIS training by practitioners and researchers. The proposed framework uses a stakeholder-oriented approach that focuses on the sources and recipients of benefits to classify positive outcomes of PMIS training. Benefits of PMIS training are clustered within the framework into general areas of positive impact which provide context for training outcomes. In addition, the framework builds on existing models for conceptual training benefits realization, with PMIS training outcomes structured according to whether benefits are likely to be realized at the individual, project team, or organizational level. The framework proposed in this paper may contribute to improved understanding of successful PMIS training practices, with several future studies planned. The outcomes of this research have implications in improving workplace learning, promoting professional success in practitioners, and improving the ability of project-focused organizations to achieve their goals and execute their missions.

INTRODUCTION

Training can be utilized to help maximize the benefits realized through the implementation of project, program, and portfolio management software toolsets. However, the relationship between PMIS training and the creation of value is not well understood. Beginning in the 1950’s, organizations began to use specialized project management software to better plan, execute, and track projects. Much research has been published that explores the extent to which training improves knowledge and performance (Salas & Cannon-Bowers, 2001). Utilization and

¹ Second Editions are previously published papers that have continued relevance in today’s project management world, or which were originally published in conference proceedings or in a language other than English. Original publication acknowledged; authors retain copyright. This paper was originally presented at the 1st Annual University of Maryland Project Management Symposium in College Park, Maryland, USA and included in the conference Proceedings in June 2014. It is republished here with permission of the author and the Project Management Center for Excellence at the University of Maryland.
effectiveness of various training delivery methods have been well-explored in the literature (Coppola & Myre, 2002; Sitzmann, Kraiger, Stewart, & Wisher, 2006). Numerous methodologies have been used to extensively evaluate the qualitative and quantitative value of training in corporate and other workplace environments (Kirkpatrick & Kirkpatrick, 2006; Phillips & Phillips, 2007; Westcott-Abudi, 2008).

LITERATURE REVIEW

The Program Evaluation and Review Technique (PERT) and the Critical Path Method (CPM) were developed beginning in the second half of the twentieth century by the U.S. Navy, Booz Allen Hamilton, Lockheed Aircraft, and Dupont De Nemours Inc. In the decades that have followed, the use of network scheduling principles and computerized project management tools have expanded dramatically (Liberatore & Pollack-Johnson, 2003). Once limited to only the largest government and corporate programs, the use of specialized software and information systems to enhance the management of projects, programs, and portfolios today is ubiquitous and widespread (Mantel, 2005). Numerous PM-oriented software packages are currently available to practitioners, and organizations are making significant investments in project, program, and portfolio management software toolsets (Kastel, 2009).

Training is one of the most widely used methods for improving individual productivity within modern organizations (Galanou & Priporas, 2009). Significant research has been published that documents the use of training to improve computer skills, achieve targeted objectives, increase knowledge, and improve job performance (Tannenbaum & Yukl, 1992). It has been shown that training activities have a positive impact on the performance of individuals and teams (Aguinis & Kraiger, 2009). A sizable body of research has been published that focuses specifically on accurately assessing the economic impact of organizational initiatives and activities. Similarly, a significant body of research has been published that addresses the quantitative measurement of value delivered by workplace training initiatives. The five-level Kirkpatrick/Phillips model of learning evaluation, created by Jack J. Phillips and Donald L. Kirkpatrick, is widely cited as the most common technique used to evaluate training programs (American Society for Training and Development, 2009; Gekoski, 1999). According to Phillips and Phillips (2007), the two standard formulas for assessing training programs in terms of economic factors are Benefit/Cost Ratio (BCR), and Return on Investment (ROI). However, most training programs will also generate intangible benefits (American Society for Training and Development, 2010). Since the literature suggests that many of the potential rewards offered by PMIS training are intangible, focusing only on the potential financial benefits of PMIS training initiatives would lead to an incomplete capture of value.

RESEARCH METHODOLOGY

Studies that empirically investigate the benefits of project management software and explore patterns of its usage are extremely limited (Ali, Anbari, & Money, 2008; Raymond & Bergeron, 2008). This translates into a lack of metrics to reliably assess PMIS training initiatives. To accurately measure the holistic impact of PMIS training efforts, a framework to measure the value of PMIS training would be extremely valuable. Due to the current lack of research that
focuses specifically on project management software toolset training, it is theorized that when organizations decide to deliver formal PMIS training, they can expect to realize benefits that result from (i) project, program, and portfolio management software and supporting systems, (ii) general business training, and (iii) the implementation of formal project, program, and portfolio management. This research seeks to generate findings that will be meaningful to the entire community of project/program/portfolio software users, in spite of unique individual and organizational characteristics such as toolset sophistication or capabilities, specific PM software packages in use, industry, or varying numbers of large and small projects.

To create a framework for PMIS training planning and evaluation, an expansive review of existing scholarly literature was undertaken, focusing specifically on publications related to PMIS, training, and adopting a formal approach to project, program, or portfolio management. Literature content was analyzed for instances where the use of PMIS, training, or PM was documented as resulting in positive outcomes through a well-defined causal relationship. Where a clear cause-effect relationship was observed to be present, the quotation was recorded and the resulting beneficial outcome was documented, with over 1,000 instances documented in the literature. The unique context of each quotation was then used to classify each documented benefit according to whether the benefit would most likely be realized at the individual, project team, and/or organizational levels. The documented benefits were subsequently subjected to a systematic refining process intended to qualitatively combine similar benefits, eliminate any benefits unlikely to result from PMIS training, and reduce the number of documented elements to the lowest number possible without eliminating valuable data from the framework.

FRAMEWORK DEVELOPMENT

A rich plethora of unique benefits were identified in the literature. These benefits have been clustered into twelve high-level groups which provide a context for the general area of potential positive improvement. The proposed framework includes the unique benefits documented in the literature, the source discipline for each benefit, and whether each benefit is likely to be realized at the individual, workgroup, or organizational levels. The twelve clustered areas of positive outcomes were developed through systematic efforts to structure the data collected from the literature into groups that accurately described the data. Additional details about the twelve clusters and the framework are presented by McCarty (2012), which provides a detailed review of literature and background research. The full literature analysis and framework development will be detailed in upcoming publications. An overview of the twelve clustered areas of positive outcomes is presented in Table 1.
### Table 1. Twelve clustered areas of positive outcomes

<table>
<thead>
<tr>
<th>Clustered Area</th>
<th>Executive-Level Summary</th>
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<tbody>
<tr>
<td>Accountability (I)</td>
<td>Improved ability to audit data and comply with regulations, improved delegation of tasks and responsibilities, and enhanced accountability. Improved clarity of roles, responsibilities, and structures.</td>
</tr>
<tr>
<td>Attitude (II)</td>
<td>Increased morale, enhanced motivation, improved commitment to objectives, decreased absenteeism, greater self-efficacy, and increased self-actualization. Improved acceptance of technology, faster adoption of technology, and improved support for organizational project, program, and portfolio management practices.</td>
</tr>
<tr>
<td>Communication and Collaboration (III)</td>
<td>Improved coordination of tasks and work, improved conflict management, enhanced teamwork, and greater knowledge of teamwork principles. Strengthened communications and enhanced collaboration among individuals, teams, and organizations.</td>
</tr>
<tr>
<td>Cost/Time (IV)</td>
<td>Enhanced budgeting, enhanced cost control, decreased overhead costs, greater profitability, and reduced variances in schedule and cost. Improved scheduling, improved speed of cash flow, reduced project throughput times, and enhanced estimating, planning, and forecasting.</td>
</tr>
<tr>
<td>Effectiveness and Efficiency (V)</td>
<td>Expanded job performance capabilities, improved job behavior and productive employee conduct, reduced incidence of mistakes. Improved effectiveness, efficiency, and productivity in individuals, teams, and organizations.</td>
</tr>
<tr>
<td>Knowledge Management (VI)</td>
<td>Improved decision making, strengthened problem solving, and better flow of information. Improved declarative knowledge, enhanced procedural knowledge, increased project management competence, and improved reporting of project, program, and portfolio data.</td>
</tr>
<tr>
<td>Market Presence (VII)</td>
<td>Increased sales, greater market share, expansion of customer base, development of new markets for products and services, and improved organizational reputation and visibility within the market.</td>
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<tr>
<td><strong>Performance</strong></td>
<td>Improved monitoring and control, enhanced attainment of project/program scope, strengthened change management practices, and increased ability to implement preventative and corrective actions. Improved quality management, enhanced quality of deliverables, reduction in rework, and greater consistency in project outcomes.</td>
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<tr>
<td>(VIII)</td>
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<tr>
<td><strong>Resource Management</strong></td>
<td>Enhanced management of human and financial resources, improved resource procurement, better allocation of resources, improved materials management, and professional development of personnel.</td>
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<tr>
<td><strong>Risk</strong></td>
<td>Reduction in project, program, and portfolio risks. Improved risk management practices and reduced risk experienced at the organizational level.</td>
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<tr>
<td><strong>Stakeholder Management</strong></td>
<td>Improved customer relations and customer satisfaction, increased employee satisfaction, reduced employee turnover, increased organizational commitment, improved engagement of stakeholders.</td>
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<tr>
<td><strong>Strategic and Enterprise</strong></td>
<td>Improved project management and business processes, and improved simultaneous management of multiple projects and programs. Enhanced governance, positive changes in culture, and improved alignment of projects and programs with organizational objectives.</td>
</tr>
</tbody>
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The proposed PMIS training impact assessment framework is a structured and organized collection of beneficial PMIS training outcomes, focusing on recipients of benefits, and sources of beneficial outcomes. The framework contains an assemblage of beneficial positive outcomes that are hypothesized to be created by PMIS training based on current literature. The properties and characteristics for each element within the proposed framework are shown in Table 2.
Table 2. Empirically derived multidimensional framework for PMIS training planning and evaluation.

<table>
<thead>
<tr>
<th>Variables and Properties</th>
<th>Levels</th>
<th>Framework Elements</th>
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<td>an. Accountability</td>
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<td>g. Market Presence</td>
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<td>h. Performance</td>
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<td>i. Resource Management</td>
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<td>j. Risk</td>
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<tr>
<td>k. Stakeholder Management</td>
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<td>l. Strategic and Enterprise</td>
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**Twelve Clustered Areas of Positive Outcomes Documented in Literature**

This variable has nominal properties. Measurements of this variable provide categorical data.

**Levels of Benefit Realization**

This variable is ordinal scale. Measurements indicate rank order information.

1. Individual
2. Project Team/Workgroup
3. Organization

**Source Discipline of Benefits**

This variable is nominal and is measured categorically.

a. PMIS Utilization
b. Training
c. Project, Program, and Portfolio Management

Employing the concept of Key Performance Indicator (KPI) utilized by OPM3 (Project Management Institute, 2008), the elements of the proposed framework are intended to serve as criterion against which an organization can determine whether an outcome exists, and the extent to which it exists. To maximize the utility, universal applicability, and flexibility of research outcomes, the proposed framework does not prescribe evaluation methodologies or processes, specific measurement techniques, scales, or units of measure for use in evaluation.
DISCUSSION

The framework has been crafted to allow for exceptional customization to promote PMIS training that focuses on developing targeted critical skills, competencies, and knowledge. Additional elements could be added to facilitate future research or PMIS training with unique requirements. Figure 1 presents the PMIS training impact measurement framework in Cartesian (X,Y,Z) coordinates, with all three variables depicted in mutually-orthogonal vector space.

![Figure 1. PMIS training impact measurement framework represented in Cartesian coordinates (X,Y,Z)](image-url)
In addition, Figure 1 conceptually illustrates how each variable behaves and how the framework functions. Level of benefit realization (i.e. individual, team, or organization) is defined as an ordinal variable with values that increase in magnitude, with values ranging from 1 to 3.

The arrow shown extending vertically from the origin along the Z axis in Figure 1 is mathematically consistent with this approach and supports the training model utilized throughout this research, which promotes the vertical transfer of benefits from individuals to project teams to organizations. Level of benefit realization values (1, 2, and 3) indicate rank-order information, where 3 is higher in value than 2, and 2 is higher in value than 1. Values do not convey interval or ratio-level data. For example, the value 2 is not twice as desirable as the value 1, nor is the value 2 equivalent to twice the value of 1. The twelve clustered areas of positive outcomes and source domain of positive benefits are classified at the nominal level of measurement. The data provided by both variables is non-numerical and non-increasing in magnitude. Lowercase letters are used in Figure 1 and Table 2 to indicate values of these variables. Both variables are depicted as nominal in Figure 1, with the data along the X and Y axes defined as categorical data that is not rank-ordered and does not increase in value. The horizontal axes in Figure 1 can be ordered to suit unique situations, allowing practitioners and researchers to easily customize and adapt the framework.

CONCLUSION

The outcomes of this research have potential implications in advancing practices related to training, promoting enhanced realization of benefits to stakeholders, and promoting success and improved outcomes in PMIS deployment and training initiatives. The data generated from this research initiative creates a groundwork for expanded research into industry training practices and successful PMIS outcomes. Since each project-focused organization is unique with different objectives for PMIS training outcomes, the framework can be tailored to focus on goals, requirements, and trainee needs within each unique environment. Practitioners, researchers, organizations, Project Management Office (PMO) personnel, executive management, training personnel, and consultants all may benefit from this research. Owners, end-users of project deliverables, and many other stakeholders with an interest in successful PMIS utilization are well-positioned to benefit as well. Improved training may benefit project personnel by enabling them to better perform their job responsibilities, thereby promoting individual success. Alternatively, improved training may teach individuals the skills necessary for a higher-level position, thereby promoting professional development and career advancement.

The current literature reveals a wealth of positive, beneficial outcomes being realized by individuals, project teams, and organizations as the result of PMIS utilization, workplace training initiatives, and the implementation of formal approaches to project, program, and portfolio management. This research builds off of the stakeholder-centric approach employed by Ibbs and Reginato (2002) and Zhai, Xin, and Cheng (2009) utilizes a benefits realization model that incorporates the concept that training benefits realized at the individual level may vertically transfer to the team level, and benefits realized at the team level may vertically transfer to entire organizations (Aguinis & Kraiger, 2009; Granger & Levine, 2010; Salas & Cannon-Bowers, 2001).
This research proposes a framework that can be adapted to facilitate future research efforts and further study of PMIS utilization, training, and value delivery. Follow up research that builds on and validates the proposed framework is in progress with additional future studies planned. The findings of this research are already being utilized to study workplace training practices and outcomes across entire industries and develop better methodologies to measure workplace training outcomes. However, there is a distinct need for research on the best ways to use training to increase the value delivered by PMIS toolsets. Ongoing research efforts may contribute to enhanced PMIS training practices, greater knowledge of factors that contribute to successful PMIS implementation, better understanding of how to maximize the benefits of PMIS training, and improved management of projects, programs, and portfolios.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to Dr. Yujie (Lawrence) Yu for his valuable contributions to this research.

REFERENCES


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