Presented to the Interdisciplinary Studies Program:

UNIVERSITY OF OREGON
APPLIED INFORMATION MANAGEMENT

Applied Information Management
and the Graduate School of the
University of Oregon
in partial fulfillment of the
requirement for the degree of
Master of Science

Identifying End-User Training Best Practices for Enterprise Systems: Improving User Adoption

CAPSTONE REPORT

Laurel Hodgins
Content Discovery & Migration Analyst
Suncor Energy

University of Oregon
Applied Information
Management
Program

Fall 2016

Academic Extension
1277 University of Oregon
Eugene, OR 97403-1277
(800) 824-2714

Approved by

_____

Dr. Kara McFall
Director, AIM Program

Identifying End-User Training Best Practices for Enterprise Systems: Improving User Adoption

Laurel Hodgins

Suncor Energy

Abstract

This study seeks to identify pedagogical best practices and instructional techniques that will facilitate end-user learning and improve adoption of enterprise systems. The study summarizes fifteen sources that explore how training and knowledge management represent challenges for Enterprise Systems implementations, why successful end-user training is important for system adoption, and what best practices and instructional techniques can be applied to more effectively train end-users during an Enterprise System implementation to support a successful project.

Keywords: *enterprise systems, end-user training, training best practices, end-user adoption*

Table of Contents

List of Tables and Figures

Introduction to the Annotated Bibliography

Problem

Information Technology (IT) implementations experience a high rate of failure (Stoica & Brouse, 2013). An IT implementation is considered a failure if the project does not meet the approved schedule, approved budget, and/or deliver the expected project scope (Whitney & Daniels, 2013). Gartner (2012) estimates that 28% of large IT projects, defined as those with a budget greater than $1 million, result in failure, while additional research estimates that 50% of all IT projects require material rework (Alami, 2016). The failure rate of IT systems has financial consequences for organizations; 66% of IT software projects run over-budget and 17% of IT projects exceed budget to the point they threaten the existence of the organization (Bloch et al., 2012). An IT project's average budget of $1.2 million (Berlin et al., 2009) represents a significant risk for an organization given the 28% failure rate of such endeavors (Gartner, 2012).

Enterprise systems (ESs), defined as "customizable, integrated software applications designed to support core business processes" (Coulson, 2010, p. 22), experience a particularly high level of failure (Lech, 2016). While typical benefits of enterprise systems are streamlined processes, reduced costs, and improved productivity (Hullavarad, O'Hare, & Roy, 2015), the organizations implementing the solutions often fail to realize these benefits (Sedera & Gable, 2010). The cost of these failures can be high (Chang, Kuo, Wu, & Tzeng, 2014). Waste Management Incorporated spent $45 million of the company's total $250 million budget on an enterprise resource planning (ERP) implementation, only to ultimately fail in the implementation (Abdinnour-Helm, Lengnick-Hall, & Lengnick-Hall, 2003). Russ Berrie and Company spent $19.2 million to implement an ERP system and had to write off another $10.4 million to

terminate the project (Olson, 2007). HP's attempt to implement a centralized ERP system resulted in $160M in backlogged orders and lost revenues, a loss that was five times greater than the initial cost of the project (Conteh & Akhtar, 2015). Because enterprise system implementations tend to be costly projects, the price of failure is typically costly as well (Chang, Kuo, Wu, & Tzeng, 2014).

Two examples of common enterprise systems with a high rate of failure are Enterprise Content Management Systems (ECMSs) and Enterprise Resource Planning (ERP) systems (Mancini, 2010; Silva & Fulk, 2012); industry statistics put the failure rate of these two enterprise systems at 50% (Mancini, 2010) and 75% (Silva & Fulk, 2012), respectively. Yet even with low success rates and high likelihood of budget overruns, the annual global investment in enterprise software is expected to grow from $314 billion in 2014 to $400 billion by 2019 (Lovelock et al., 2015) as organizations seek to generate business value (Aron & Smith, 2011).

Enterprise systems touch every part of the business and are often complex, making learning the systems a challenge and formal training a necessity for the end-users (Sedera & Gable, 2010). Formal training is particularly important for enterprise systems due to the scope of the user bases and the complex functionality that often accompanies these systems (Sedera & Gable, 2010). Further, formal training is a mechanism through which the expected adoption of enterprise technologies can be improved (Marshall et al., 2008). Training will reduce the stress employees experience when learning new systems by familiarizing them with system benefits (Rajan & Baral, 2015) and is proven to have a positive influence on user adoption (Gallego, Bueno, Racero, & Noyes, 2015).

The absence of effective training results in inefficient and ineffective systems usage (Norton et al., 2012, p. 647); effective knowledge management is a critical success factor in

enterprise system implementations (Sedera & Gable, 2010). The correlation between training and user adoption is established, pointing to the need for best practices in enterprise system training that will improve user adoption and literacy rates, increase the overall success rates for projects, and improve benefits realization.

Purpose

The projected annual spend on enterprise software, expected to grow to $400 billion globally by 2019 (Lovelock et al., 2015), indicates that the need for end-user training on the use of these systems will continue to exist for the foreseeable future. As one of the critical success factors for an enterprise system implementation is end-user adoption (Sedera & Gable, 2010), and end-user adoption is strongly and positively impacted by training (Norton et al., 2012), there is a need to identify enterprise system training best practices, techniques, and strategies to enable users to adopt and successfully use these complex systems.

The purpose of this study is to present literature concerning pedagogical best practices and instructional techniques that will facilitate end-user learning and improve adoption of enterprise systems. For the purposes of this study, enterprise systems are defined as "customizable, integrated software applications designed to support core business processes" (Coulson, 2015, p. 22).

Research Question

What instructional best practices and techniques should be employed during end-user training for ES deployments to improve user adoption and ES program success rates?

Audience

The primary audience for this literature review is ES instructional designers and trainers; the people who are developing training materials and delivering them to the end-users.

Developing an understanding of existing best practices and successful instructional techniques will assist instructors in creating training material and designing curriculum that will have a positive influence on ES end-user understanding and adoption. The support staff who will be responsible for assisting users post-implementation have an interest in understanding what techniques, materials, and artifacts are most effective for teaching users enterprise system concepts, as this understanding will assist them in explaining concepts to users and guiding them to the appropriate supporting documentation. The support staff are responsible for the sustainment of the new enterprise systems and knowing what their end-users have been taught, potential gaps in system knowledge, and how to communicate concepts to users will better equip them for their roles.

Lastly, both the IT and Learning and Development managers and directors who are supervising the implementation of the training and approving expenditures, budgets, and schedules have a high level of interest in ensuring that the work is executed correctly the first time and that they are approving the best possible solutions. They are accountable for the projects and the investments and have significant stakes in successful implementations that deliver the promised benefits.

Search Report

Search strategy. References and information for this literature review are identified with the University of Oregon library and Google Scholar. Searches are conducted using key words as identified below and then limited to criteria set out by the researcher to identify the most relevant sources for this work.

Data collection. The search results are limited to peer-reviewed articles, with full text available online and publication dates within a timeframe of 2006-present. The search is

conducted to identify information pertaining to training prior to and during deployment of enterprise systems. Various searches are conducted using the key words and phrases listed below in differing combinations. When relevant articles are identified, the "view similar articles" feature is used to determine if there are any related articles listed that might be of use in the literature review. Similarly, the references of useful papers are reviewed and relevancy to this literature review considered. Search results are saved for future reference in the UO Library account of the researcher. Specific articles that are of use are documented in Zotero to facilitate creation of the bibliography and reference list. Zotero documents the required information to complete an American Psychological Association (APA) reference such as author, publication, date, and doi and provides a field to store article abstracts to support the creation of the annotated bibliography.

Key Words

- *ECMS training*
- *E-learning*
- *End-user training*
- *End-user acceptance*
- *Enterprise information systems*
- *Enterprise solutions*
- *Enterprise systems*
- *Enterprise technology*
- *ERP training*
- *Implementation success/failure*
- *Information technology training*

- *Instructional design*
- *Instructional techniques*
- *New technology training*
- *Technology adoption*
- *Training best practices*
- *Training strategies*
- *Training techniques*

Search engines and databases. The searches are executed in the following databases using the search engines previously mentioned.

- Academic OneFile
- ACM Digital Library
- DOAJ
- Elsevier
- IEEE Computer Science Digital Library
- JSOTR
- Procedia
- Science Direct

Searches are also executed in the following journals using the same keywords.

- International Journal of Information Management
- International Journal of Enterprise Information Systems
- Journal of Management Information Systems
- Journal of Organizational and End User Computing
- TechTrends: For Leaders in Education & Training

- Educational Technology
- Research and Development
- Educational Technology Research and Development
- Computers and Education
- Computers in Human Behavior

Reference evaluation criteria. References are reviewed for several criteria prior to inclusion in this literature review using reference evaluation criteria provided by the Center for Public Issues Education (2014). The authority of the author/s is the first consideration. The article search is limited to peer-reviewed journals to ensure that there is support from other academics for the work and the author's credentials, both academic and professional, are reviewed. Authors who have advanced degrees and have published other books or articles are considered more authoritative. The affiliations of the author/s are also considered, either to postsecondary institutes or research or professional organizations.

The timeliness of the material is of significance given the rapidly evolving nature of enterprise systems and the associated technological infrastructure. For this reason, the references are limited to those with publication dates between 2006-2016. Relevancy to this literature review is evaluated by comparing the focus of the paper to the three categories that the researcher has selected for review in the annotated bibliography: enterprise system implementation challenges, correlation between training and end-user adoption, or training best practices for enterprise systems. The abstract and introduction are reviewed to determine if the source discusses or provides insight into any of the aforementioned topics.

Quality is ascertained through a review of the grammar and spelling in the article, the flow of the information presented, as well as the references. If the references are of suspect quality or are from a source with fewer requirements for publication such as a blog, the article is not used. Lack of bias is identified by evaluating whether the author has considered more than one viewpoint and by investigating the affiliations of the author/s and publisher. Reports, survey results, and articles that are written by an industry source selling either products or services related to the published material are not utilized.

Documentation approach. Zotero is the primary means of documenting search results. A general Zotero collection is created for each week research is conducted and articles that are of interest are initially captured in the weekly Zotero collection for further review. An article is of interest if the above research criteria are met and the abstract appears to be relevant to the research question. Collections are also created for each of the three categories selected for the annotated bibliography as well as a fourth collection for references. At the end of the week, the articles are reviewed and either marked as irrelevant, added to one of the Zotero category collections for the annotated bibliography, or added to the reference collection. All the collections are exported as a CSV file to Microsoft Excel and combined to create a master log as a record of all sources reviewed.

Annotated Bibliography

The annotated bibliography contains 15 resources that provide information on aspects of enterprise systems and the implementation of these systems that are relevant to the identification of end-user training best practices that will influence system adoption. The literature is intended to assist instructional designers in developing training materials that will maximize user adoption rates of enterprise systems as well as for project and IT managers justifying the approval of training expenditures on enterprise system implementations.

The literature is divided into three sections for review: (a) enterprise system implementation challenges, (b) the correlation between training and end-user adoption, and (c) training best practices for enterprise systems. Each annotation includes a complete APA bibliographic citation, a complete abstract, and a brief summarization of the article content and its relevancy to this literature review.

Enterprise Systems Implementation Challenges

Conteh, N., & Akhtar, J. (2015). Implementation challenges of an enterprise system and its advantages over legacy systems. *International Journal on Computer Science and Engineering, 7*(11), 120–128.

Abstract. This paper explores the implementation challenges of Enterprise Resource Planning in the industry and its advantages over legacy systems. The paper depicts the historical background of ERPs and their significance in facilitating coordination among the functional areas of organizations in the industry. It also discusses the role it plays in promoting the activities of Supply Chain Management (SCM) and Customer Relationship Management (CRM). The paper presents empirical data on ERPs and their challenges and implementation. A discussion has also been presented over some of the major

implementation issues and considerations related to the connectivity, integration, and customization of the ERP systems. The paper closes with a conclusion on the role and place of ERPs in the modern enterprise systems.

Summary. This article provides a background on the evolution and role of Enterprise Resource Planning in the modern organization and discusses the challenges of implementation for this widely-utilized type of enterprise system. The author notes the inherent difficulties with process and change management as well as the need for customizations as some of the major challenges presented during these complex implementations. The article cites that only 30% of implementation cost is from the software purchase; the rest is attributable to the other required organizational changes and support activities. The authors advise that careful requirements identification, assessment of business processes changes, and planning for knowledge transfer are essential to a successful ERP implementation.

This article is relevant for this study because it provides a specific example of the magnitude of the investment required in managing change and knowledge throughout an ERP implementation. Conteh and Akhtar also highlight knowledge transfer as a critical success factor for an implementation, acknowledging the importance of user training.

Govindaraju, R. (2012). Enterprise systems implementation framework: An organisational perspective. *Procedia - Social and Behavioral Sciences, 65*, 473–478. http://doi:10.1016/j.sbspro.2012.11.151

Abstract. Although many companies have spent large investments on ES implementation, there is extensive evidence that only a limited number of them have been successful with the implementation. Realising the potential benefits offered by ES

implementation and the high failure rate found in practice, the study reported here aims at developing a framework that can help to provide a better understanding of how the process can be managed to bring the benefits for the implementing organisations. Implementation is defined as a process started with decision to adopt ES systems and finished when organisation already used the systems as an integral part of the organisation. To develop the conceptual framework, results of previous research had been studied. Based on the results of previous studies, utilising relevant theories in the field of information system implementation and organisational change, a conceptual framework was developed. The framework addresses the project as well as the post-project stage of ES implementation, and a number of essential issues within the stages. System alignment, knowledge development, change mobilisation are the essential issues highlighted in the project stage while institutionalisation and system optimisation are essential issues in the post-project stage.

Summary. The article outlines a framework for a successful enterprise system implementation that covers both the project phase and the post-project phase. The author notes that a successful implementation extends beyond managing the technology and requires the effective management of people and supporting processes as well. The project phase of the framework consists of three stages: alignment, change mobilization, and knowledge development. The alignment of business, organization, and technology processes is the first of the three stages. Change mobilization consists of consolidating the support of the stakeholders and enabling employee ownership of the change. Knowledge development encompasses the transfer of knowledge from ES vendors to in-house resources to develop the knowledge required to sustain the change. The second and

third stages are focused on addressing people changes such as training, communication, and engagement, and highlight the importance of change and knowledge management to a successful project.

This article is relevant for this study because the framework the authors establish for a successful ES implementation includes two components that are focused on engaging, empowering, and enabling the end-users of the system. Training and knowledge management are identified as mechanisms for achieving this engagement and the authors emphasize the importance of developing knowledge to support a successful and sustained change.

Lech, P. (2016). Causes and remedies for the dominant risk factors in Enterprise System implementation projects: the consultants' perspective. *SpringerPlus, 5*(238), 1–12. http://doi:10.1186/s40064-016-1862-9

Abstract. The purpose of this research was to investigate the causes of the dominant risk factors, affecting Enterprise System implementation projects and propose remedies for those risk factors from the perspective of implementation consultants. The study used a qualitative research strategy, based on e-mail interviews, semi-structured personal interviews with consultants and participant observation during implementation projects. The main contribution of this paper is that it offers viable indications of how to mitigate the dominant risk factors. These indications were grouped into the following categories: stable project scope, smooth communication supported by the project management, dedicated, competent and decision-making client team, competent and engaged consultant project manager, schedule and budget consistent with the project scope, use of

methodology and procedures, enforced and enabled by the project managers, competent and dedicated consultants. A detailed description is provided for each category.

Summary. The article summarizes research that identifies both the critical success factors and the project risks/failure factors for enterprise system implementations. The author interviewed consultants with experience in enterprise system implementations and observed enterprise system implementation projects; from this qualitative analysis, Lech identifies the ten most influential risk factors. These risk factors are: (a) unclear/changing goals/scope/requirements; (b) communication problems; (c) lack of client team dedication to/involvement in the project; (d) poor project management; (e) lack of change management procedures; (f) poor planning/estimation/scheduling; (g) improper/insufficient client team expertise; (h) overscheduling of consultants; (i) lack of/insufficient resources/consultants; and (j) lack of decision-making capabilities in the client team.

Lech then groups his findings into seven implementation goals: (a) keep the project scope stable; (b) introduce and maintain smooth communication supported by the project management; (c) assure dedicated and competent client team with decision-making capabilities; (d) appoint a competent and engaged consultant project manager, (e) keep the budget and schedule consistent with the scope; (f) enforce the usage of the methodology and procedures; and (g) assure that the consultants are competent and dedicated to the project. Finally, the author recommends actions and activities to remediate the risk attached to each goal; key among his recommendations and relevant to this study are training the client team on the system before or at the beginning of the

project and consulting project managers with system expertise to help identify risks and provide resolution.

This article is relevant for this study because the author distills enterprise system implementation risks down to seven broad categories and within three of those categories, cites training for both the client and consultants as viable means of mitigating risk to the project, establishing the importance of training to project success.

Soja, P., & Paliwoda-Pekosz. (2009). What are real problems in enterprise system adoption? *Industrial Management & Data Systems, 109*(5), 610–627. http://doi.org/10.1108/02635570910957614

Abstract. Purpose - The purpose of this paper is to understand the nature of the difficulties experienced during enterprise system (ES) adoption. More specifically, this paper aims to investigate interrelations between these difficulties and therefore identify the source difficulties that cause other problems. Design/methodology/approach – The research methodology is based on grounded theory approach and draws from the experience of a few dozen ES adopters. Interviews with ES practitioners are conducted and open coding procedure is applied during the process of data gathering. Next, axial coding is used to verify problem categories and subcategories. Finally, causal mapping analysis is performed in order to reveal interrelations among difficulties and elicit source problems. Findings – The results suggest causal relationship among various problem categories and reveal seven source difficulties in ES implementation: knowledge of employees holding various positions in the adopter organisations' hierarchy, changes in the enterprise occurring during ES adoption, finance, enterprise structure, information technology (IT) infrastructure, data import and legacy systems, and training schedule.

Research limitations/implications – The need for further research in order to incorporate multiple stakeholder view, project phase, and success measure. Practical implications – The results may help practitioners in reaching the problems' source and thus facilitate overcoming the actual problems rather than ineffectively struggling with their symptoms. As a result, practitioners may better anticipate possible problems and assess potential threats to their projects. Originality/value – This study gives insight into the actual problems experienced by ES adopters. It also identifies the real problems encountered during ES implementation as well as the other problems that occur as a result of these source difficulties.

Summary. The author identifies eight categories of problems encountered during enterprise system implementations and articulates how the problems are related to determine root causes. The problem category "employees" is the most significant source of issues. This category includes attitudes towards systems, lack of skills and knowledge, as well as human error and represents 23% of all the problems encountered during enterprise system implementations. Through data analysis, the author postulates that the 43 initial problems can be attributed to seven root causes, most which stem from knowledge management and training issues. These root causes are: (a) lack of knowledge of employees within the adoption organization, (b) changes in the enterprise occurring during ES adoption, (c) inadequate estimate of project cost, (d) challenges in aligning the enterprise structure to the ES requirements, (e) IT infrastructure, (f) legacy systems that need to be replaced, and (g) the training schedules that do not provide employees with the necessary skills at the right time. Of the seven root causes, the ones that are most applicable to this research study are the lack of knowledge of employees

and the impact of the training schedule. Similar to the findings of Lech (2016), the myriad of issues that ES project implementations encounter can be broadly classified as training and knowledge management issues are again cited repeatedly as root causes of ES implementation challenges. The author refers to lack of knowledge as the "most important source problem" that is present in all risk categories for ES implementations (p. 623).

Correlation Between Training and End-User Adoption

Gallego, M. D., Bueno, S., Racero, F. J., & Noyes, J. (2015). Open source software: The effects of training on acceptance. *Computers in Human Behavior, 49,* 390–399. http://dx.doi.org/10.1016/j.chb.2015.03.029

Abstract. Open Source Software (OSS) is an alternative to proprietary software. It is growing in popularity, which has brought about an increase in research interest. Most of the research studies have focused on identifying individual personal motives for participating in the development of an OSS project, analyzing specific solutions, or the OSS movement, itself. No studies have been found which have undertaken research on the impact of user experience and training on OSS. The study reported here sought to identify factors that predict acceptance of technologies based on OSS after training in these solutions. A research model based on the Technology Acceptance Model (Davis, 1989) was developed. Furthermore, the possible moderating effects of users' gender, age and level of education were analyzed. It was found that external determinants such as user training, user fit, technological complexity and trainers' support were important indicators in the success of adopting these solutions.

Summary. This study uses the Technology Acceptance Model (TAM) which analyzes user acceptance of a technology through four different constructs to consider how user training influences user adoption in Open Source Software. The four constructs of TAM are (a) perceived usefulness, (b) perceived ease of use, (c) usage behavior, and (d) intention of use. The study seeks to test twelve different hypotheses that focus on how the different constructs of the TAM model are impacted by training. Of particular relevance to this study are six of the hypotheses that are focused on training and elements of user acceptance: (a) the perceived ease of use after training on OSS has a positive effect on the perceived usefulness of OSS, (b) the perceived ease of use after training on OSS has a positive effect on usage behavior, (c) the perceived usefulness after the training on OSS has a positive effect on usage behavior, (d) the perceived usefulness after training on OSS has a positive effect on the intention to use an OSS solution, (e) the usage behavior of a technology solution based on OSS after training will have a positive effect on intention of use, and (f) user training in OSS has a positive effect on perceived usefulness. The hypotheses concerning the relationship between training and acceptance proved true in the study. While the focus of the study was on open source software, the TAM model can be applied to other technologies. The positive correlation identified by Gallego et al. between the impact of training on usage and user attitudes towards software supports the need for continuing investment in training as part of information technology project implementations.

Marler, J., Liang, X., & Dulebohn, J. (2006). Training and effective employee information technology use. *Journal of Management*, *32*(5), 721–743. http://doi.org/10.1177/0149206306292388

Abstract. Using longitudinal survey data from a matched sample of 94 administrative employees across a range of job levels in an organization that was implementing a Web-based enterprise-wide resource planning software system, the authors examined the relationships between technology training and employees' acceptance and preparation for mandated technology use. Structural equation analyses indicated that employees' beliefs about resources to support use of new software mediated the relationship between technology training and intention to use new software outside of formal training and prior to mandated use. Theoretical and practical implications are discussed.

Summary. The study conducted by Marler et al. considers the role of training in employee acceptance of technology, specifically when there is an enterprise-wide implementation. The study investigates how the quality and extent of training influence the end user's intentions to use the new technology. While Marler et al. test four different sets of hypotheses, the first set is most relevant to this study in establishing the correlation between user training and system adoption. The first set of hypotheses propose that (a) the extent of training should be positively related to intention to use information technology, and (b) training reactions will be positively related to intention to use information technology. The extent of training is an influencing factor in system adoption as the skill sets of the users grow with training, as does the intention to apply the skills outside of the training environment as their knowledge expands. The users' reactions are significant in that the positive response to training will improve motivation to learn and translate to greater intention to use the new system.

The hypotheses were tested gathering feedback in training surveys administered before and after the delivery of a two-month long training session to 219 participants. The

survey results support the hypotheses and indicate a positive relationship between the users reactions to training and their intention to use the new systems, as well as a positive relationship between the extent of training and intention to use the new system. These findings support the idea that there is a correlation between training and user acceptance and adoption of a new technology.

Rajan, C. A., & Baral, R. (2015). Adoption of ERP system: An empirical study of factors influencing the usage of ERP and its impact on end user. *IIMB Management Review, 27*(2), 105–117. http://dx.doi.org/10.1016/j.iimb.2015.04.008

Abstract. Complex information systems like the ERP integrate the data of all business areas within the organization. The implementation of ERP is a difficult process as it involves different types of end users. Based on literature, we proposed a conceptual framework and examined it to find the effect of some of the individual, organizational, and technological factors on the usage of ERP and its impact on the end user. The results of the analysis suggest that computer self-efficacy, organizational support, training, and compatibility have a positive influence on ERP usage which in turn has significant influence on panoptic empowerment and individual performance.

Summary. The study conducted by Rajan and Baral considers how three different classifications of external variables impact the intention of the end user to adopt a new enterprise resource planning system. The three categories of external variables are, (a) individual characteristics, which is comprised of computer self-efficacy; (b) organizational characteristics, which refers to both organizational support and training; and (c) technological characteristics, which considers both technological complexity and compatibility. The Technology Acceptance Model (TAM) is used as the framework to

compare how each of the variables impacts user intentions to adopt the new ERP system. The authors craft five sets of hypotheses, each set relating to one of the variables identified above. Of relevance to this study were hypotheses 3a and 3b: training will have a positive effect on perceived usefulness of the ERP system and training will have a positive effect on the perceived ease of use of the ERP system. All five sets of hypotheses correlate the external variables to the TAM beliefs of perceived usefulness and perceived ease of use. Lastly, there are two additional hypotheses that consider how the TAM beliefs influence ERP adoption: (a) there is a positive relationship between the perceived usefulness of the ERP system and the intention to use the ERP system, and (b) there is a positive relationship between the perceived ease of use and intention to use the ERP system.

After conducting a survey of 181 users who had participated in an ERP implementation in the past five years, the study found that there is a significant positive relationship between the external variables and the TAM beliefs. Specifically, training more strongly influences the perceived ease of use of the system, which in turn significantly impacts the intention to use the system. The study supports the correlation between end user training and system adoption, justifying the need to identify and implement training best practices.

Sedera, D., & Gable, G. (2010). Knowledge management competence for enterprise system success. *The Journal of Strategic Information Systems, 19*(4), 296–306. http://dx.doi.org/10.1016/j.jsis.2010.10.001

Abstract. This study conceptualizes, operationalises and validates the concept of Knowledge Management Competence as a four-phase multidimensional formative index.

Employing survey data from 310 respondents representing 27 organizations using the SAP Enterprise System Financial module, the study results demonstrate a large, significant, positive relationship between Knowledge Management Competence and Enterprise Systems Success (ES-success, as conceived by Gable et al., 2008); suggesting important implications for practice. Strong evidence of the validity of Knowledge Management Competence as conceived and operationalised, too suggests potential from future research evaluating its relationships with possible antecedents and consequences.

Summary. The authors of this study hypothesize that the higher the organization's level of ES-related knowledge management competence, the higher the level of success the Enterprise System will realize. To test this hypothesis, the authors surveyed 319 users who participated in an ERP implementation at one of twenty-seven government agencies in the past three years. The survey examines how the agencies performed in four phases of knowledge management: (a) knowledge creation, (b) knowledge-transfer, (c) knowledge retention, and (d) knowledge application. Most relevant to this study is the knowledge transfer phase, which involves both the informal transfer of knowledge between users and the deployment of formal training. Sedera and Gable's hypothesis is supported by the data collected; there is evidence of a significant and positive correlation between all the knowledge management phases and ES success. The authors also state that successful knowledge management is potentially the most significant success factor for ES implementations. Training is a key component of the knowledge management framework and these findings support the importance and influence of knowledge management on a successful ES adoption.

Sharma, R., & Yetton, P. (2007). The contingent effects of training, technical complexity, and task interdependence on successful information systems implementation. *MIS Quarterly, 31*(2), 219–238. http://www.jstor.org/stable/25148789

Abstract. Research has investigated the main effect of training on information systems implementation success. However, empirical support for this model is inconsistent. We propose a contingent model in which the effect of training on IS implementation success is a function of technical complexity and task interdependence. A meta-analysis of the literature finds strong support for the model, explaining the inconsistent findings reported in the literature. Implications for theory and practice are discussed.

Summary. Sharma and Yetton note the positive correlation that exists between training and end-user adoption. They expand on past research by analyzing twenty-seven previous studies that describe training as a significant influencer of IS implementation success and identifying that there is an unexplained variance in the degree of correlation between the two. The authors posit that two additional variables, technical and transactional complexity, influence the degree to which training impacts end user adoption. The paper poses two hypotheses: (a) the effect of training on implementation success is a positive function of technical complexity, and (b) the effect of training on implementation success is a positive function of task interdependence. The model Sharma and Yetton propose to examine how training influences success consists of four different cognitions. Two individual cognitions correspond to the technical complexity, (a) application knowledge and (b) business context knowledge, and two cognitions correspond to transactional complexity, (a) transactive memory and (b) collaborative task knowledge.

The researchers use meta-analysis to re-examine previous studies to arrive at the conclusion that both hypotheses are correct; the technical complexity and task interdependence influence the degree to which training can influence user adoption. The relevance to this study is that the findings support the positive relationship between end-user training and system adoption generally but also emphasize its importance in enterprise system implementations that would be considered both technically and transactionally complex.

Training Best Practices for Enterprise Systems

Coulson, T., Olfman, L., Ryan, T., & Shayo, C. (2010). Enterprise systems training strategies: Knowledge levels and user understanding. *Journal of Organizational and End User Computing*, *22*(3). http://dx.doi.org/10.4018/joeuc.2010070102

Abstract. Enterprise systems (ESs) are customizable, integrated software applications designed to support core business processes. This paper reports research contrasting the relative effectiveness of two strategies for ES end-user training that differentially reflect the Sein, Bostrom, and Olfman (1999) hierarchical knowledge-level model. One strategy--procedural--involves training that targets the three lowest knowledge levels of the model (command-based, tool-procedural, and business-procedural); the other--tool-conceptual--involves training that also includes a higher knowledge level (tool-conceptual). A non-equivalent quasi-experimental design was used for groups of senior business students being trained to use an authentic ES. Performance measures were administered during training and ten days after training concluded. Both experiments demonstrated that training involving the tool-conceptual knowledge level leads to superior mental models, compared with training oriented toward lower knowledge levels, as expressed in the

recollection and communication of ES concepts. Tool-conceptual knowledge-level training can be used to promote understanding and communication, and should be incorporated into training strategies for ES.

Summary. Coulson et al. conduct a study to examine the difference in the knowledge developed by users who are offered training through two distinct training strategies. The first training strategy is referred to as procedural training (PT) and consists of three different knowledge levels: (a) command-based, (b) tool-procedural, and (c) business-procedural. Command-based training focuses on teaching users about the system interface, the syntax and semantics. The tool-procedural training encompasses teaching users the steps to input and recall data from an ES system. The business-procedural training teaches users how to complete an entire business process that is executed in an ES system. Combined, these three knowledge levels make up procedural training.

The second training technique is referred to as tool-conceptual training which, in addition to the three knowledge levels previously mentioned, also includes a fourth level known as tool-conceptual training. In tool-conceptual training the users are also provided with an overview of the entire process, or a big picture view. The study hypothesizes that users receiving training in all four knowledge levels, or TCP training, will have a better understanding of the system they are being taught.

The authors conducted five-week training sessions with two user groups. One group used the PT training that is favored by ES vendors, and the other used the TCP training. The study confirms the hypothesis; the users in the TCP training group can recall more information about the training they received and the ES on which they are trained. This finding is relevant for this study as it provides a concise training best practice that

organizations should incorporate in addition to the training provided by the vendor or supplier. Spending time teaching users how the work they are doing fits with the organizational process improves knowledge retention, which not only benefits the individuals receiving the training but also improves their ability to teach others the same concepts.

Davis, C., & Hikmet, N. (2008). Training as regulation and development: An exploration of the needs of enterprise systems users. *Information& Management*, *45*(6), 341–348. http://dx.doi.org/10.1016/j.im.2008.04.002

Abstract. The view of the organization as a system that 'processes' information or 'solves' problems is at odds with the dynamics of change associated with the development and use of IS in an organization. A significant consequence of this mismatch is in training that does not meet the needs of either the user or management communities, giving rise to sub optimal organization performance and inertia. We explored such issues by examining recent research into organizational development and training. The particular challenges presented in the development and implementation of large-scale enterprise systems were explored to reveal a discontinuity in the constructs underpinning a development. A theoretic model that bridged some of the gaps between the bodies of research was developed and a brief empirical study provided a proof of concept for the model. The paper concludes with a discussion of the model's implications for theory and practice.

Summary. Davis and Hikmet conduct a study in a medical clinic where enterprise systems are in use to prove the efficacy of a new training model that classifies knowledge creation and learning types. Knowledge creation is classified using the SECI model

developed by Nonaka, which includes four different processes through which individuals create knowledge: socialization, externalization, combination, and internalization. The authors combine these processes with the four learning types identified by Gnyawali and Grant: adjustive, operative, reinventive, and formative, to create their own theoretic model. This model pairs a learning type with a knowledge type in a quadrant where the vertical access is labeled as development, or the need for acquisition of tacit knowledge, and the horizontal access is labeled regulation, or the need for explicit knowledge. The quadrant-based model recommends learning and training methods based on the need for users to acquire explicit knowledge and tacit knowledge in the system implementation. The authors recommend that enterprise system implementations engage this model and framework as part of a training needs assessment and classification of learning requirements.

This article is relevant for this study because the authors recommend a model for instructional designers to use that will allow them to identify the most appropriate way to assess training needs and develop and adapt their training materials to ensure the most effective end user training experience.

Gupta, S., Bostrom, R., & Huber, M. (2010). End-user training methods: What we know, need to know. *The DATA BASE for Advances in Information Systems, 41*(4), 3–39. http://doi.org/10.1145/1899639.1899641

Abstract. End-User Training (EUT) has enjoyed a rich tradition of research in Information Systems. However, with the growing pace of change in technology and the dynamic nature of business, organizations are spending an increasing amount of money on end-user training. Training methods are also changing with little research to support

new approaches. Thus, extensive research is required in the future. To be credible, end-user training research should preserve and build upon the significant literature that exists, both in IS and Education. This paper provides a review of EUT literature focusing on training methods. It summarizes research findings, while pointing out key future research issues.

Summary. In this article, the authors review literature that discusses the three different phases of end-user training (EUT), (a) initiation, (b) formal training, and (c) post-training, and the impact each phase has on the trainee. The literature has been categorized into distinct topics and summaries are provided of the findings related to each topic. The categories reviewed are: (a) pre-training: beliefs and goals; (b) target system; (c) formal training and learning process; (d) learning techniques; (e) early learning techniques or training methods; (f) social cognitive theory based training methods; (g) collaborative training methods; (h) technology-mediated training methods; (i) learning-from-computers: computer based training; (j) the learning process; and (k) individual differences.

Following the literature review on these topics, the authors identify gaps in current knowledge of EUT where further research is needed. The authors summarize the overall themes they would like to explore in EUT, including the impact of contextual factors such as race/class/power and how they affect EUT outcomes, the difference in EUT processes for complex versus simple systems, and the forms of assessment that can be used to assess EUT effectiveness. Of relevance to this study are the sections on early learning techniques, training methods based on social cognitive theory, and learning processes. In these sections, recommended training techniques based on the literature

reviewed are: (a) utilizing personally relevant training methods; (b) providing feedback in the training process; and (c) engaging technology-based scaffolds to support the end user.

Laoledchai, Y., Land, L., & Low, G. (2008). Improving the effectiveness of end-user training outcomes. *ACIS 2008 Proceedings*. Paper 103. http://aisel.aisnet.org/acis2008/103

Abstract. End-user training (EUT) does not deliver the expected value to the organisations when end users do not transfer the skills learned to their workplace. Training effectiveness occurs when end users not only have the ability but are willing to transfer the skill learned to improve their job. This study proposes a model of EUT effectiveness which explicitly considers training effectiveness outcomes and incorporates attitude and motivation as two key antecedents. We propose a longitudinal field experiment to examine the influence of persuasive communication and goal-matching on EUT effectiveness. The proposed theoretical framework is based on a thorough review of literature from multiple disciplines such as Psychology, Education, Organisational Behaviour and Information Systems.

Summary. The authors propose a research model for evaluating end user training effectiveness. The model evaluates the effectiveness of training using three different components: (a) *can do* outcomes, which represent the ability of the user to use knowledge and skills learned in training; (b) *will do* outcomes, which represent the willingness and intentions to use the training delivered; and (c) *does do* outcomes, which represent the extent to which users transfer the skills and knowledge to their workplace. The authors propose that these outcomes can be greatly influenced by the attitude and motivation of users, two determinants that are critical to the success of an IT implementation.

The authors cite previous research that positively correlates users' attitudes and motivations to training effectiveness. The impact of attitude is seen in the users' reactions to the training situations and the impact of motivation to their performance of tasks. Of relevance to this study are the authors' recommended means of influencing users' pre-training attitudes and pre-training motivations to improve the effectiveness of the training. Engaging in persuasive communication to positively influence user attitudes and matching purpose goals of the end users to the training design will improve the motivation of the user to use the IT application. Utilizing these methods to connect with users and align goals prior to commencing training is a best practice that will help project managers and instructional designers realize the maximum benefit from their training programs.

Norton, A., Coulson-Thomas, Y. M., Joseph, C., & Ashurst, C. (2012). Delivering training for highly demanding information systems. *European Journal of Training and Development, 36*(6), 646–662. http://doi.org/10.1108/03090591211245530

Abstract. Purpose - There is a lack of research covering the training requirements of organisations implementing highly demanding information systems (HDISs). The aim of this paper is to help in the understanding of appropriate training requirements for such systems. Design/methodology/approach - This research investigates the training delivery within a customer-facing organisation that successfully implemented an HDIS. A case study was undertaken to identify resource allocation during the implementation lifecycle and training guidelines were prepared following in-depth interviews with client and supplier consultant practitioners. Findings - Organisations implementing HDISs should invest in training throughout the implementation lifecycle. Two areas of training were

found to be of importance: end-user training to avoid technical-isomorphism and post-implementation training to avoid system atrophy. Practical implications - Literature shows that training attracts the smallest proportion of the implementation resources. This research shows, however, the critical role training plays in delivering a successful HDIS implementation. Originality/value - The phasing of training requirements allows training resources to be allocated more effectively into end-user and post-implementation training, which is necessary for the full benefits of HDIS to be realised.

Summary. The authors discuss training requirements for highly demanding information systems (HDIS) through a case study based on an ERP II implementation. There are nine different training requirements identified: (a) developing a holistic training strategy, (b) incorporating customer management training, (c) timing of the training, (d) providing skills-based training, (e) administering training course evaluations, (f) promoting the system benefits, (g) ensuring knowledge transfer from the vendor, (h) treating people as knowledge workers, and (i) internally disseminating knowledge. These requirements are broken into two areas of training: end-user training (a to e) and post-implementation training (f-i).

From the case study, Norton et al. provide recommendations for the organization for each of the nine training requirements. Of relevance to this study are the recommendations made for the end-user training activities. The authors recommend capturing the needs and views of the client and supplier in the training strategy, incorporating content into the training material that is specific to each role to encourage user ownership of the system, scheduling training as close to go-live as possible and allowing for practice time, conducting a needs assessment that segregates users based on role, and conducting

evaluations of training effectiveness. The training strategy identifies the preceding best practices in support of each different end-user training activity to ensure that benefits are realized from the implementation.

Salaka, V., Cheng, C., & Prabhu, V. (2007). Rollout plan for training and education in enterprise information systems. *International Journal of Enterprise Information Systems, 3*(4), 22–32.

Abstract. In this article, we propose a rollout plan for training students and employees about enterprise information systems (EIS) that are encountered in an organization. Our rollout plan follows the different stages of a typical EIS project from inception to completion. These stages are modeling, planning, simulation, transaction, integration, and control. This ensures that an employee who is trained by this plan has an acquaintance with the typical information systems in an organization. Further, for training and research purposes we developed prototype information systems that emulate the ones usually found in organizations. In this article, we discuss some of the case studies we conducted with the prototype systems

Summary. Salaka et al. develop and document a rollout plan for training enterprise information systems (EISs). The best practices of training early, well in advance of a system implementation, as well as reserving 10-15% of the total implementation budget for training are recommended. The training rollout plan includes six stages where users interact with different components of the EIS: (a) modeling, (b) simulation, (c) planning, (d) integration, (e) transaction, and (f) control. The modeling stage is where requirements, objectives, and business processes are established. Planning involves the evaluation of alternatives and simulation to establish the feasibility of different alternatives. Integration

focuses on teaching users the benefits of an integrated organization. The transaction stage teaches users how to execute the transactions that support the integration of different components of the system. Lastly, control focuses on training the last part of the information system where data is returned to the system and users to make informed business decisions. The authors state that by using this rollout plan, users follow a systemic training program that will familiarize them with all the different component of an EIS.

This article is relevant for this study because it provides a framework that identifies when training should be delivered, what components should be included, and how different training requirements can be categorized. Using this plan, project managers and trainers can deliver the most relevant training at the appropriate time in an ES implementation to support the best possible absorption of the material by end users.

Conclusion

Enterprise Systems can help organizations to streamline processes, reduce costs, and improve productivity (Hullavarad, O'Hare, & Roy, 2015); however, they are risky projects (Chang, Kuo, Wu, & Tzeng, 2014) that are known for high levels of failure (Mancini, 2010; Silva & Fulk, 2012). As ineffective training and knowledge management are both significant risks factors for successful enterprise system implementation (Conteh & Akhtar, 2015; Coulson et al., 2010; Govindaraju, 2012; Sedera & Gable, 2010; Soja & Paliwoda-Pekosz, 2008), it is paramount to the success of these project to deliver effective end-user training to drive end-user adoption of these systems (Gallego et al., 2015; Marler, Liang, & Dulebohn, 2003; Rajan & Baral, 2015; Sedera & Gable, 2010; Sharma & Yetton, 2007; Soja & Paliwoda-Pekosz, 2008).

This Annotated Bibliography is organized to identify and summarize articles relevant to three different themes concerning end-user training for enterprise system (ES) implementations. These themes are: (a) enterprise system implementation challenges; (b) the correlation between training and end-user adoption; and (c) training best practices for enterprise systems. These summaries are designed to assist instructional designers and trainers in developing training materials and strategies for ES implementations, as well as to impart the importance of end-user training on ES project success to project managers and IT management to encourage the allocation of appropriate resources to this work.

Enterprise System Implementation Challenges

Implementing new enterprise systems represents a significant risk for organizations due to the historically high failure rates of such projects (Lech, 2016; Mancini, 2010; Silva & Fulk, 2012) and the disparity between the benefits sought and realized for many implementations (Sedera & Gable, 2010). In general, researchers have agreed that end-user training and

knowledge management are critical success factors for enterprise system implementations (Conteh & Akhtar, 2015; Coulson et al., 2010; Govindaraju, 2012; Soja & Paliwoda-Pekosz, 2008; Sedera & Gable, 2010).

There are multiple sources of problems on enterprise system implementations (Soja & Paliwoda-Pekosz, 2008). Some issues include insufficient expertise of employees and vendors (Lech, 2016; Soja & Paliwoda-Pekosz, 2008), ineffective management of the change (Conteh & Akhtar, 2015; Govindaraju, 2012), and unsuccessful knowledge management (Govindaraju, 2012; Soja & Paliwoda-Pekosz, 2008). Conteh and Akhtar (2015) expand upon the ERP implementation challenges with both change and process management due to the frequent need for extensive customizations to fit the packaged software to the business processes (Conteh & Akhtar, 2015). The implementations require significant resources beyond the purchase of a software suite; Conteh and Akhtar (2015) note that the initial software purchase is only 30% of the actual implementation cost, the balance being attributable to the management and support of the required organizational changes and related support activities.

Govindaraju (2012) uses a phased-project implementation model to foster successful change and knowledge management in ES implementations, noting the important and prominent roles that these processes play in successful ES implementation projects. Knowledge transfer, communication, and end-user training are emphasized as important components of the model to help end-users through the change, engaging them and empowering them to take some ownership of the process to sustain the changes. Soja and Paliwoda-Pekosz (2008) identify "knowledge and training as the main causes of the majority of difficulties" (p. 625) during an ES implementation and recognize knowledge as the "most important source problem" (p. 623), as it is present in all of the different ES implementation risk categories they identified. Training is

also cited as being important to the success of an ES implementation project, with Soja and Paliwoda-Pekosz (2008) specifically recommending that it be delivered at the most appropriate time in the process to the correct audience.

While the root causes of ES implementation challenges identified by each study are not the same, researchers did find that a significant number of these issues can be directly correlated to inadequate or ineffective training (Lech, 2016; Soja & Paliwoda-Pekosz, 2008) and mitigated through training-related activities (Govindaraju, 2012; Lech, 2016). In particular, end user training has been found to positively impact end user adoption and intention to use the system (Gallego et al., 2015; Marler, Liang, & Dulebohn, 2006; Rajan & Baral, 2015; Sedera & Gable, 2010; Sharma & Yetton, 2007; Soja & Paliwoda-Pekosz, 2008).

The Correlation Between Training and End-User Adoption

Knowledge management competence is considered to be one of and perhaps the most significant influencers of enterprise system (ES) success (Sedera & Gable, 2010; Soja & Paliwoda-Pekosz, 2008). Gallego et al. (2015) identify a positive correlation between training and both the actual enterprise system use and the attitudes users maintain towards the system. Similarly, a survey conducted by Marler, Liang, and Dulebohn (2006) shows a positive relationship between the amount of training ERP users received and their intention to use the system. Rajan and Baral (2015) developed similar conclusions based upon a survey of 181 users who had participated in ERP implementations over a span of five years; their analysis of the survey results indicated that training has a positive influence on both the perceived ease of use and the perceived usefulness of the ERP system, both of which positively influence the user's intention to use the system. Sharma and Yetton's (2007) work also identified a positive correlation between training and user adoption, and also noted that the more complex the system,

the greater the degree to which training would improve user adoption. While multiple researchers agreed that there is a positive relationship between training and end-user adoption of ESs (Gallego et al., 2015; Marler, Liang, & Dulebohn, 2003; Rajan & Baral, 2015; Sedera & Gable, 2010; Sharma & Yetton, 2007; Soja & Paliwoda-Pekosz, 2008), the findings of Sharma and Yetton (2007) emphasize a need for user training to ensure enterprise system adoption, as these systems are known to be both technically and transactionally complex.

Training Best Practices for Enterprise Systems

The sources identified for this annotated bibliography provide twelve different best practices that can be applied when planning and developing end-user training material for an enterprise system implementation to maximize the effectiveness of the training. Table 1 summarizes these best practices.

Table 1

Summary of Enterprise System Training Best Practices

Training Best Practice	**Source**
Use tool-conceptual training methods; provide users with an overview of the entire process and teach them how the work they do fits into the organizational process.	Coulson, Olfman, Ryan, & Shayo, (2010)
Develop a training plan based on both an assessment of users' training needs and classification of the learning requirements.	Davis & Hikmet, (2008)
Use personally relevant training methods.	Gupta, Bostrom, & Huber, (2010)
Provide feedback for the user during the training.	Gupta, Bostrom, & Huber, (2010)
Engage technology-based scaffolds as a means of supporting the user.	Gupta, Bostrom, & Huber, (2010)
Use persuasive communications and language to positively influence user attitudes towards the change and training.	Laoledchai, Land, & Low, (2008)
Align personal goals of the end users with the goals of the training.	Laoledchai, Land, & Low, (2008)

Training Best Practice	**Source**
Incorporate content into the training material that is specific to each role to encourage user ownership of the system.	Norton, Coulson-Thomas, Joseph, Ashurst, (2012)
Document the training needs carefully during the planning stages.	Norton, Coulson-Thomas, Joseph, Ashurst, (2012)
Use evaluations to solicit feedback on the training effectiveness.	Norton, Coulson-Thomas, Joseph, Ashurst, (2012)
Train as close to go-live as possible to maximize retention while allowing time for end users to practice and refresh skills.	Norton, Coulson-Thomas, Joseph, Ashurst, (2012)
Allocate 10-15% of the total project budget for training.	Salaka, Cheng, & Prabhu, (2007)

Summary

End-user training is an important mechanism for encouraging user adoption of enterprise systems (Marler, Liang, & Dulebohn; Rajan & Baral, 2015; Sedera & Gable, 2010; Sharma & Yetton, 2007; Soja & Paliwoda-Pekosz, 2008) as there are a number of challenges that hinder successful implementations that can be mitigated with effective end-user training (Lech; 2016; Sedera & Gable, 2010; Soja & Paliwoda-Pekosz, 2008). Training material can be developed by instructional designers that leverages the best practices identified in Table 1, incorporating these findings from recent studies to support end-users in successfully learning and adopting enterprise systems. Given the historically high failure rates of enterprise systems implementation projects (Lech, 2016; Mancini, 2010; Silva & Fulk, 2012), the challenging nature of the projects and associated risks (Conteh & Akhtar, 2015), and the high cost of failure (Chang, Kuo, Wu, & Tzeng, 2014), pursuing best practices and training techniques for instructional designers, IT decision makers, and project managers to employ that are correlated to successful outcomes is a worthwhile effort.

References

Adbinnour-Helm, S., Lengnick-Hall, M. L., & Legnick-Hall, C. A. (2003). Pre-implementation attitudes and organizational readiness for implementing an Enterprise Resource Planning system. *European Journal of Operational Research, 146*, 258–273. http://dx.doi.org/10.1016/S0377-2217(02)00548-9

Alami, A. (2016). Why do information technology projects fail? *Procedia Computer Science, 100*, 62–71. http://doi: 10.1016/j.procs.2016.09.124

Aron, D., & Smith, M. (2011). *Executive summary: Benefits realization: The gift that keeps on giving* (No. G00219568). Gartner. Retrieved from https://www.gartner.com/doc/1786314?ref=SiteSearch&sthkw=reasons%20for%20investment&fnl=search&srcId=1-3478922254

ATD Research. (2015). *ATD State of the Industry Report*. ATD Research. Retrieved from http://www.td.org/Publications/Research-Reports/2015/2015-State-of-the-Industry

Chang, B., Kuo, C., Wub, C.-H., & Tzeng, G.-H. (2015). Using Fuzzy Analytic Network Process to assess the risks in enterprise resource planning system implementation. *Applied Soft Computing, 28*, 196–207. http://dx.doi.org/10.1016/j.asoc.2014.11.025

Berlin, S., Raz, T., Glezer, C., & Zviran, M. (2009). Comparison of estimation methods of cost and duration in IT projects. *Information and Software Technology*, 51(4), 738–748. http://doi:10.1016/j.infsof.2008.09.007

Bloch, M., Blumberg, S., & Laartz, J. (2012, October). Delivering large-scale IT projects on time, on budget, and on value. *Digital McKinsey*. Retrieved from http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/delivering-large-scale-it-projects-on-time-on-budget-and-on-value

Center for Public Issues Education. (2014). Evaluating information sources. Retrieved from http://www.piecenter.com/wp-content/uploads/2014/08/evaluateinfo.pdf

Conteh, N., & Akhtar, J. (2015). Implementation challenges of an enterprise system and its advantages over legacy systems. *International Journal on Computer Science and Engineering, 7*(11), 120–128.

Coulson, T., Olfman, L., Ryan, T., & Shayo, C. (2010). Enterprise systems training strategies: Knowledge levels and user understanding. *Journal of Organizational and End User Computing*, *22*(3). http://dx.doi.org/10.4018/joeuc.2010070102

Davis, C., & Hikmet, N. (2008). Training as regulation and development: An exploration of the needs of enterprise systems users. *Information& Management, 45*(6), 341–348. http://dx.doi.org/10.1016/j.im.2008.04.002

Ford, K. (2014). *Improving training effectiveness in work organizations*. New York, NY: Psychology Press.

Gallego, M. D., Bueno, S., Racero, F. J., & Noyes, J. (2015). Open source software: The effects of training on acceptance. *Computers in Human Behavior, 49,* 390–399. http://dx.doi.org/10.1016/j.chb.2015.03.029

Gartner. (2012). *Survey shows why projects fail* (No. G00231952). Gartner. Retrieved from http://www.gartner.com/doc/2034616/survey-shows-projects-fail

Govindaraju, R. (2012). Enterprise systems implementation framework: An organisational perspective. *Procedia - Social and Behavioral Sciences, 65*, 473–478. http://doi.org/doi:10.1016/j.sbspro.2012.11.151

Gupta, S., Bostrom, R., & Huber, M. (2010). End-user training methods: what we know, need to know. *The DATA BASE for Advances in Information Systems, 41*(4), 3–39. http://doi.org/10.1145/1899639.1899641

Guseva, I. (2014). How to: Change management in enterprise technology projects. *EContent, 37*(2), 31.

Hullavarad, S., O'Hare, R., & Roy, A. (2015). Enterprise Content Management solutions—Roadmap strategy and implementation challenges. *International Journal of Information Management, 35*(2), 260–265. http://doi.org/10.1016/j.ijinfomgt.2014.12.008

Hunt, S., & Choi, H. (2015). Critique of the empirical literature on enterprise systems --over a half decade of research. *Journal of Management Information and Decision Sciences, 18*(1).

Laoledchai, Y., Land, L., & Low, G. (2008). Improving the effectiveness of end-user training outcomes. *ACIS 2008 Proceedings*. Paper 103. http://aisel.aisnet.org/acis2008/103

Lech, P. (2016). Causes and remedies for the dominant risk factors in Enterprise System implementation projects: The consultants' perspective. *SpringerPlus, 5*(238), 1–12. http://doi:10.1186/s40064-016-1862-9

Lovelock, J.-D., Hale, K., Lewis, B., Hahn, W. L., Atwal, R., Graham, C., … Dornan, M. (2015). *Forecast alert: IT spending, worldwide, 3Q15 update* (No. G00296930). Gartner. Retrieved from http://www.gartner.com/document/3142129?ref=solrAll&refval=176357021&qid=2e66abbde5922fcb7ce293a1df480a49

Mancini, J. (2010, May). 8 Reasons why ECM implementations experience high failure rates, and what you do about it. *AIIM*. Retrieved from http://info.aiim.org/digital-landfill/newaiimo/2010/05/25/8-reasons-ecm-fail

Marler, J., Liang, X., & Dulebohn, J. (2006). Training and effective employee information technology use. *Journal of Management*, *32*(5), 721–743. http://doi.org/10.1177/0149206306292388

Marshall, B., Mills, R., & Olsen, D. (2008). The role of end-user training in technology acceptance. *Review of Business Information Systems*, *12*(2), 1–8.

Norton, A., Coulson-Thomas, Y. M., Joseph, C., & Ashurst, C. (2012). Delivering training for highly demanding information systems. *European Journal of Training and Development*, *36*(6), 646–662.

Olson, D. (2007). Evaluation of ERP outsourcing. *Computers & Operations Research*, *34*, 3715–3724. http://doi:10.1016/j.cor.2006.01.010

Rajan, C. A., & Baral, R. (2015). Adoption of ERP system: An empirical study of factors influencing the usage of ERP and its impact on end user. *IIMB Management Review*, *27*(2), 105–117. http://dx.doi.org/10.1016/j.iimb.2015.04.008

Rasli, M., & Mansor, A. (2012). *Business impact and ROI: A proposed approach to learning and development investment (Vol. 40, pp. 596–603)*. Presented at The 2012 International Conference on Asia Pacific Business Innovation & Technology Management, Procedia - Social and Behavorial Sciences. http://doi: 10.1016/j.sbspro.2012.03.236

Sedera, D., & Gable, G. (2010). Knowledge management competence for enterprise system success. *The Journal of Strategic Information Systems*, *19*(4), 296–306. http://dx.doi.org/10.1016/j.jsis.2010.10.001

Sharma, R., & Yetton, P. (2007). The contingent effects of training, technical complexity, and task interdependence on successful information systems implementation. *MIS Quarterly, 31*(2), 219–238. http://www.jstor.org/stable/25148789

Silva, L., & Fulk, K. (2012). From disruptions to struggles: Theorizing power in ERP implementation projects. *Information and Organization*, *22*, 227–251. http://dx.doi.org/10.1016/j.infoandorg.2012.06.001

Soja, P., & Paliwoda-Pekosz. (2009). What are real problems in enterprise system adoption? *Industrial Management & Data Systems, 109*(5), 610–627. http://doi.org/10.1108/02635570910957614

Sorebo, O., & Eikebrokk, T. R. (2008). Explaining IS continuance in environments where usage is mandatory. *Computers in Human Behavior*, *24*(5), 2357–2371. http://dx.doi.org/10.1016/j.chb.2008.02.011

Stoica, R., & Brouse, P. (2013). IT project failure: A proposed four-phased adaptive multi-method approach. *Procedia Computer Science*, *16*, 728–736. http://doi:10.1016/j.procs.2013.01.076

Whitney, K., & Daniels, C. (2013). The root cause of failure in complex IT project: Complexity itself. *Procedia Computer Science, 20*, 325–330. http://doi:10.1016/j.procs.2013.09.280