

Evaluation of Trained Intellectual Capital Efficacy: A Literature Review and Its Limitations

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Abstract

This investigation aims to analyze models and methods for evaluating e-learning format training and education. It addresses evaluation approaches, the impact of authors in related research, and aspects to consider in future studies to enhance the efficacy of e-learning programs.

The study employs a mixed-method approach, combining quantitative and qualitative analyses. A comprehensive review is conducted to identify models and evaluation methods used in e-learning training. Data from empirical and theoretical studies, as well as author contributions, are analyzed to identify patterns and gaps.

Interviews with e-learning experts will provide qualitative insights into potential improvements for future research. Initial explorations were undertaken to identify search tactics, keywords, and data sources, spanning 2012-2021 in WOS, and focusing on 2012, 2017, and 2021 in Scopus. Document selection for review and analysis is based on inclusion and quality criteria.

Results highlight the use of multidimensional models, including pre and post-tests, cross-sectional evaluation at various points, diverse instruments (Likert Scale, Focus Groups, Interviews), and self-efficacy.

The primary limitations concern the lack of long-term follow-up, raising questions about result stability. A longitudinal study is suggested. The research aims to provide insights into e-learning training evaluation and guide future investigations in this domain.

Keywords: Online Training; Educational Evaluation; Training Methodology; E-Learning; Training Effectiveness

Introduction

Hand in hand with a company's productivity lies the development of its working capital, closely tied to continuous job-related training. Diez and Abreu (2009) state that "Employee training is of great importance; it allows the company to understand its usefulness in economic, productive, work environment, and labor competitiveness aspects that can be developed or enhanced within the organization." Acquiring employees with essential competencies is a challenge for industrial and educational sectors. These competencies are imperative for promoting continuous improvement, leading change, nurturing talent development, and effectively achieving strategic objectives.

From a local perspective (in Chile), training is defined as: “The process aimed at promoting, facilitating, encouraging, and developing workers’ skills, abilities, or levels of knowledge to enable them to have better opportunities and living and working conditions while increasing national productivity, aiming at the necessary adaptation to technological processes and structural changes in the economy” (Law 19518, Article 10). Although continuous training is employed in all fields, strategically working with adults can be a viable resource to enrich the quality of life, highlight valuable aspects, and establish a culture based on universal values (Anguiano, Beracoechea, Gómez, 2005). In this context, training assumes a concrete and undeniable role. However, the rapid adoption of Information and Communication Technologies (ICT) during the pandemic has driven generations toward intensive use of these tools. This change has affected training implementation methodologies, forcing institutions responsible for training to employ various strategies to ensure efficiency and effectiveness in knowledge transfer to adults. As stated by Suarez (2018), considering Virtual Education as a space capable of facing modern challenges is significant since it shares similar principles with andragogy, centered on adult professional preparation and development.

According to Padilla and Juárez (2006, p. 11), “...In the current context, dominated by constant and rapid technological change, employee training - as a form of human capital generation - plays a very important role in strengthening competitiveness.” Thus, the importance of training leads us to ask: how can we assess effectiveness in the workplace given the virtual changes we are experiencing? Understanding that companies and states allocate significant resources annually for this purpose. Consequently, from this perspective, it is not illogical to find a wealth of studies and research conducted in specific fields. However, in the midst of these inquiries, a clear methodology has not yet been outlined to determine whether efforts in the implementation of training courses or activities effectively achieve their objectives. This is why this study will conduct a Comprehensive Review with the purpose of identifying evaluation approaches used in various training contexts to assess the effectiveness of learning outcomes. This will allow for the extrapolation of these evaluation instruments to multiple contexts.

It is essential to understand that, as noted by García-Ruiz, Aguaded, and Bartolomé-Pina (2018, p. 26), “In recent years, amid profound technological advances and the universalization of devices, it is evident that distance education is achieving great success not only in its didactic quality but also in user satisfaction. This could lead to giving it priority over other teaching modalities more linked to the traditional educational model, which is entirely face-to-face.” Among the notable benefits are improving the flexibility of the learning process to optimize results (Bartolomé, 2004); improving the cost-benefit ratio of higher education (Graham, 2013); and fostering and facilitating student creativity and innovation (Gros and Lara, 2009).

Understanding training as an essential tool for enhancing skills and improving job performance, it is crucial to set clear objectives. To achieve the expected results, it is necessary to ensure the evaluation of the impact and profitability of training as an essential strategy to maintain the quality of the learning process, as suggested by Pineda (2000). In this context, considering technological transformations, it is worth highlighting the analysis by Giacchero, Donnini, and Martin (2007), who explain that Information and Communication Technologies (ICT) facilitate accelerated learning and the rapid application of knowledge, influencing labor management and the improvement of job roles, highlighting the potential for continuous training.

However, the greatest challenge lies in establishing methods for evaluating the effectiveness of training, where the measurement of results and the actual determination of the benefits for the company resulting from training are virtually absent, according to Álvarez, Freire, and Gutiérrez (2017). In the Chilean context, there are opportunities through the tax franchise, and not considering it as an important aspect in companies would be a mistake. Therefore, measuring impact becomes essential. This raises the research question: How can we efficiently and timely measure the impact of e-learning training, providing results that companies and organizations can use to design comprehensive training plans for their employees?

It is also worth noting the statement by Fernández (2003) that “e-Learning is nothing more than a novelty in our way of ‘e-living’, as we progress towards a society where telecommuting, online shopping, among other aspects, are becoming increasingly important.”

Methodologies

In this study, we adopt an approach based on the scientific method, following the methodology proposed by Whittemore and Knaf (2005) to conduct a literature review. The primary purpose of this review is to summarize and analyze the themes that have emerged in the field of training and education, given its critical role in the economic development of countries. Following the approach of Kiger, Varpio, and Jarvis-Selinger (2014), we seek to assess the international impact of trained intellectual capital and its contribution to the efficiency of companies and organizations.

The central objective of this research, in line with Frost, Garside, Cooper, and Britten (2011), is to explore the evaluation and monitoring methods used in the field of training and education. To achieve this, we employ various research methods, including critical analysis of the literature, a document review technique, as well as quantitative and descriptive description of the approaches used in different studies. These research methods focus on specific cognitive areas, following the proposal of Hong, Pluye, Bujold, and Wassef (2017), such as health, social sciences, and education, all relevant to address contemporary challenges and globalization.

In summary, this research is based on a rigorous scientific method and is grounded in the review of existing literature, following recognized methodologies and approaches in academic research.

In this study, the “Integrative Review” approach is introduced as part of the methodology. This approach seeks to merge and synthesize the results of qualitative and quantitative studies into a coherent review. The Integrative Review aims to overcome the limitations of traditional review approaches, allowing for a more holistic and in-depth understanding of a topic by including different types of evidence. The main characteristics of this design are:

1. *Inclusion of Different Types of Studies*: Unlike conventional reviews, the Integrative Review encompasses both quantitative and qualitative studies, and even mixed-methods studies.
2. *Flexible Methodological Design*: The Integrative Review adapts to a variety of methodological designs, expanding the diversity of collected evidence.
3. *Synthesis of Diversified Data*: Instead of merely combining numerical results, the goal is to coherently synthesize qualitative and quantitative findings to identify common patterns and relationships.
4. *Combined Quality Assessment*: The quality of both quantitative and qualitative studies is assessed using appropriate criteria for each study type.
5. *Focus on Comprehensive Interpretation*: The Integrative Review seeks to understand the topic, incorporating both quantitative and qualitative data to provide a more comprehensive and enriching interpretation.
6. *Generation of Innovative Perspectives*: The integration of diverse evidence can lead to the identification of new or deeper perspectives and insights that might escape more limited review approaches.

Research Questions

The research is guided by the following key questions:

1. What models are employed to evaluate e-learning training and education?
2. What methods are applied to measure the effectiveness of e-learning training and education?
3. What is the contribution of authors in research and results related to the e-learning training and education process?
4. What aspects could be incorporated into future research to enhance the planning and execution of e-learning training and education programs?

Inclusion/Exclusion Criteria

Scientific publications related to “training for life, labor skills, continuing education, e-learning training,” and other related topics will be included, considering the following characteristics:

- Open Access documents and scientific articles will be included when the number is reasonable (more than 100).
- Two languages, English and Spanish, will be included.
- The search will be conducted among scientific publications indexed in the mainstream Scopus and Web of Science databases in the last 4-8 years, depending on the number of articles in the search.
- Studies based on areas of Education, Business and Administration, Social Sciences, Psychology, Economics, and Engineering and Psychology (and Multi-Area when necessary) (or a similar area according to the search database) will be included.

It is also considered important that for inclusion criteria, an important definition in e-learning is “non-face-to-face training that, through technological platforms, enables and flexibilizes access and time in the teaching-learning process” (García-Peñalvo, 2005).

Search Strings and Databases

An exhaustive literature search was initiated on February 3, 2021, in the academic databases Web of Science and Scopus, which, according to Pérez-Escoda (2017), represent the greatest relevance in the field of scientific research. In the first filter, preliminary searches were conducted to identify relevant search strategies, search terms, and sources of information in periods ranging from 2012 to 2021 (Scopus) and primarily in 2012, 2017, and 2021 (Web of Science) for articles in both Spanish and English.

The search string used was: (“Training for life” or “Formación para la vida”) and (“Labor skills” or “Competencias laborales”) and (“Educación continua” or “Continuing education”) and (“E-learning training” or “Capacitación e-learning” or “elearning training” or “Capacitación elearning”).

The initial time used was from 2012 to 2021, which was later updated on May 23, 2021, extending the search period from 2017 to 2021.

To select the documents obtained through the search protocol, the following reviews will be conducted:

- *Identification*: Titles of documents obtained in the database are reviewed, followed by a review of the Abstract.
- *Review*: Documents that passed the First Review (Identification) will be those that are read and analyzed in their entirety.

In the identification phase, search strings were used in both databases, focusing on “Title” and “Abstract.” No filters or limitations were applied to retrieve the highest number of results and avoid the exclusion of pre-indexed materials. Instead, language, document type, study area, and year of publication restrictions were included in the exclusion criteria for the selection process.

Level 1 (Identification): In the review stage, articles from the previous stage were further examined, taking into consideration the following criteria:

- Reading the title.
- Review of the introduction or abstract.

Level 2 (Review): To delve into the articles that passed to this stage, the introduction and context were reviewed.

Level 3 (Eligibility): In this stage, a deeper review was carried out, including the methodology, results, and discussion.

- Search for models for measuring learning/training effectiveness.
- Search for training program follow-ups.

Level 4 (Included Records): Articles that had inconclusive conclusions, did not present significant data, or lacked medium to long-term measurements were excluded.

Publication Selection Process

The search in academic databases yielded a total of 1,195 articles. Based on the title and abstract, the abstract was primarily reviewed, delimiting the objective and scope of the study to establish, in this first review, whether they were related to the scope of the SLR (i.e., if their topic related to the evaluation or tracking of training or education). Articles that did not meet the established criteria were excluded.

The publications that finally passed the search filters and reached the final stage were 11, with less than 3% of duplicate articles, mainly due to the following reasons:

- They did not meet quality criteria.
- They did not fit the research topic.
- They were specific programs that lacked evaluation.
- The results were very preliminary.
- The focus was on the methodology used rather than the evaluation.
- Among others.

Results

Data Extraction Procedure

Data collection was carried out using an Excel spreadsheet. In this spreadsheet, the source of the data was meticulously recorded, including the specific database, article title, author(s) name, publication year, and a section, either partial or complete, of the abstract. These data were classified based on the previously defined criteria:

- *Other Topic:* Encompasses articles unrelated to the focus of our study.
- *Specific Program:* Includes articles whose topics could be related to our study, although there is no clear follow-up or evaluation of training or education activities.
- *Interesting:* Includes articles where a clear follow-up or evaluation of training or education activities is evident.

Data Synthesis and Analysis

The obtained results underwent a qualitative synthesis process and were summarized in tables. Articles that shared similar descriptions of tracking or evaluation methods were grouped to facilitate analysis and comparison.

The distinctive features of the studies, the intervention and evaluation strategies adopted, as well as the results obtained, were synthesized both qualitatively and quantitatively and documented in summary tables. Articles presenting effective methods for evaluating and tracking training and education programs were grouped to simplify the analytical process.

Characteristics of Selected Studies

In the preliminary Identification stage, out of 1,206 records located through the search in the Scopus and WOS databases, a significant majority of the examined studies were concentrated in the English language and were derived from the Scopus source. The most prominent topics addressed in these studies include:

- Training for Life (11%).
- Labor Skills (9%).
- Continuing Education (9%).

In the WOS database, it was observed that the highest proportion of articles focused on:

- E-learning Training (10%).
- Labor Skills (7%).
- E-learning Training (9%).

While “Labor Skills” emerges in both data sources, considering articles from both sources, the common percentage aligns with expectations (8.5%).

It is crucial to highlight that despite the recurrence of the term “Labor Skills” in both databases, the selected articles adhere to a perspective that encompasses labor competencies and skills, aiming to enhance productivity and promote economic development at both the local and regional, and global levels. As we progress in the analysis and delve into the selected articles, a more solid consolidation is observed in terms of research, not only within the context in which they were conducted but also in the applied techniques and methods.

From the articles in the eligibility stage, the results are shown in the following table:

Database	Articles that meet the criteria		Articles that do not meet the criteria		Total
SCOPUS	18	30,5%	41	69,5%	59
WOS	9	32,1%	19	67,9%	28
Total	27		60		87

Source: Own elaboration.

Table 1: Level 3 (Eligibility).

When reviewing eligibility, it was found that 30% of the reviewed articles met the criteria, with most entries coming from SCOPUS, which doubled the number from WOS. However, it’s important to note that this data doesn’t relate to the quality of the found and analyzed research.

Out of the 27 articles at level 3, the final selection yielded 11 articles (8 from SCOPUS and 3 from WOS) that met the final criteria. These criteria included articles with conclusive conclusions, significant data, or medium to long-term measurements (follow-up). A subsequent analysis was carried out on the methods used for the employed model and evaluation, leading to the following conclusions:

Database	Articles with Likert Scale		Articles based on the Kirkpatrick 4-Level Model		Articles with self-efficacy measurement	
SCOPUS	4	36,4%	2	18,2%	2	18,2%
WOS	0	%	1	9,1%	1	9,1%
Total	4		3		3	

Source: Own elaboration.

Table 2: Level 4 (Included Records).

Evaluation of Models Used in E-learning Training and Development

In this section, we aim to address the following question: What approaches are used to evaluate training and development programs in the context of e-learning? This question relates to the relevance of learning transfer, whose fundamental purpose lies in the evaluation of training programs implemented within the company (Manel, Renta, & Jiménez, 2017).

According to the results obtained, it is evident that 18.2% of the studies chose to employ Kirkpatrick’s 4-Level Model, which has been expanded or modified to suit the specificities of the e-learning environment. Meanwhile, the rest of the articles present their own customized approaches to evaluation, except for one article that adopts the FET-WL model.

Measurement of Training and Development Effectiveness

Evaluating the effectiveness of training and development programs plays a crucial role, as its results allow for a well-founded analysis of training and decisions regarding the continuation of the process, considering aspects such as associated costs, achievements, productivity improvements, and changes in work focus (Tyurina et al., 2021).

In the context of this research, we have examined the methods used to measure the effectiveness of training and development. This analysis is essential for understanding the various strategies adopted in evaluation. Our findings indicate the following (see Figure 2):

- 36.4% of the studies chose to use the Likert scale in their questionnaires to collect data. However, in the rest of the articles, it is not specified clearly which method was used, although different approaches in questionnaire formulation are highlighted.
- 27% of the articles consider self-efficacy as a measure of personal perception or belief in one’s own abilities, in line with the evaluation model’s criteria.
- Additionally, 27% of the articles chose to use Cronbach’s Alpha coefficient to measure the reliability of internal consistency. It should be noted that while it is not the only tool used, its relevance is emphasized. Additional tools include Exploratory Factor Analysis (EFA) by principal components (PCA), the Kaiser-Meyer-Olkin (KMO) test, Bartlett’s sphericity test, and mixed multivariate analysis of variance (MANOVA).

The use and combination of these methods in measuring the effectiveness of training and development demonstrate the diversity of approaches adopted in the evaluation of these programs, enriching the knowledge landscape in this area.

It is evident that there is no single method or instrument for validation, as it depends on the nature of the training/development being implemented.

Authors’ Contributions in Research and Results in the Training/Development Process

Within the context of the various analyzed articles, various perspectives that constitute valuable contributions to research are revealed, playing a fundamental role in training and development processes. Within this context, key approaches are identified that deserve attention, as they enrich the formative aspects. Based on the comprehensive review of publications, it is evident that these contributions have an exceptionally interesting character. They not only integrate diverse concepts applied to training and learning transfer but also go beyond the mere incorporation of models in their research. Instead, they delve into a multifactorial analysis that considers the process as a multidimensional entity. This multifaceted approach provides a more robust structure for measuring effectiveness and adds strength to the results obtained.

Contributions	Author / Research	Database
Evaluation of the Correlation Between Self-Perception and Self-Efficacy in Training Programs	Fernández et al. “Relationship between self-perception and self-efficacy for the development of competencies in Vital Life Support in high-fidelity clinical simulation environments”. <i>Educacion Medica</i> 19.6 (2018): 320-326.	Scopus
Effectiveness of Learning Using New Media to Enhance and Improve Knowledge in Highly Productive Teams	Bonabi et al. “Effectiveness of smart phone application use as continuing medical education method in pediatric oral health care: A randomized trial. <i>BMC Medical Education</i> ”. 19.1 (2019): 431.	Scopus

Self-Efficacy as an Alternative Measure of Training Effectiveness	Jonson, Pettersson, Rybing, Nilsson, Prytz. "Short simulation exercises to improve emergency department nurses' self-efficacy for initial disaster management: Controlled before and after study". <i>Nurse Education Today</i> 55 (2017): 20-25.	
Combining Direct and Indirect Assessment Methods	Albert, Perez, Garcia, Diaz. "The evaluation as a tool for training learning through the remote laboratories". <i>Redu-Journal of University Teaching</i> 14.1 (2016): 377-4	WOS
Quantitative Design Exploring Factors Influencing Training Effectiveness	Pineda et al; "How to measure the efficacy of VET workplace learning: the FET-WL model". <i>Education and Training</i> 57.6 (2015): 602-62	WOS

Table 3: Research Contributions.

Future Research Directions

Proposed	Author / Research	Database
Effectiveness in MOOC courses	Wewer et al. "Health care professionals from developing countries report educational benefits after an online diabetes course". <i>BMC Medical Education</i> 17.1 (2017): 97.	Scopus
	Gil-Quintana y Osuna-Acedo. "Citizenship training through smooocs: A participative and intercreative learning". <i>Sustainability (Switzerland)</i> 12.20 (2020): 1-13.	Scopus
	Gil y Martinez. "The students' empowerment in the Smooc". <i>Complutense Journal of Education</i> 29.1 (2018): 43-60	WOS
Use of new training modalities (asynchronous, hybrid, among others)	Law et al. "Evaluation of a National Online Educational Program in Geriatric Psychiatry". <i>Academic Psychiatry</i> 40.6 (2016): 923-927.	Scopus
	Nandi, Xhafa, Subirats y Fort. "Real-time emotion classification using eeg data stream in e-learning contexts". <i>Sensors</i> 21.5 (2021): 1-26.	Scopus
	Vercher-Ferrandiz. "Proactive tutoring as a factor in improving the results of online training". <i>Rie-Educational Research Magazine</i> 39.1 (2021): 91-109	WOS
New technologies and innovation in teaching-learning processes	Area. "Towards the digital university: where are we and where are we going?". <i>Ried-Iberoamerican Journal of Distance Education</i> 21.2 (2018): 25-30	WOS
	Fuentes. "Creating a pattern of eLearning from the consideration of issues related to the design of learning objects for a specific case study cell phone use to support Lifelong Learners, from the perspective of instructional design". <i>Distance Education Network-Journal Number</i> (2012).	
	Gabarda, Marin, Mercedes Romero. "Evaluation of digital resources for children". <i>Edmetic</i> 10.1 (2021): 135-153.	WOS

Undoubtedly, the pandemic has driven rapid technological adoption in teaching and learning processes. This phenomenon, in fact, paves the way for substantial innovations, particularly in the field of models and methods aimed at incorporating training and education into the corporate environment.

One highly relevant aspect is the prominent rise of Massive Open Online Courses (MOOCs) as a highly impactful and far-reaching component in disseminating new knowledge to a wide and diverse range of organizations. In parallel, there is a growing emphasis on promoting new modalities, such as blended learning (b-learning), which combines in-person and virtual elements, as well as the adoption of specific tutoring for e-learning environments, especially in high-stakes processes. Additionally, there is an opportunity in the progressive integration of innovative technologies designed to enhance performance, quality, and learning in the corporate context.

The technological acceleration, along with the diversification of teaching approaches and the integration of cutting-edge tools, forms a solid foundation for future research development. A promising horizon is emerging in which the intersection of technology and education will continue to trigger significant innovations and advances in promoting learning within organizations.

Conclusion

From the 11 articles that have been subjected to review, a series of conclusions emerge that shed light on the diversity of assessment methods used. Although these methodologies vary, they all agree on the importance of conducting pre- and post-tests that encompass multiple dimensions, including characteristics of the participants, previous levels of knowledge, workplace context, and job position, as well as knowledge acquired during the training. In the context of the training process, it is also essential to include tangible performance indicators, as suggested by Giannakos, Mikale, and Pappas (2021). Furthermore, the implementation of mixed assessment methods is recommended to achieve more robust and widely applicable conclusions for various training programs.

However, it's important to note that many of the studies used unique and divergent approaches, highlighting the absence of a consolidated standard for these evaluations. As a result, comparing different studies becomes challenging, making it difficult to identify which approach was most effective.

Based on the comprehensive review, the following crucial findings can be summarized for the formulation of an effective training and education evaluation model:

- Adoption of a cross-sectional study design that includes pre- and post-tests is recommended.
- Evaluated groups should have statistically significant sample sizes.
- Measuring self-efficacy is valuable, although its weight in the results should be approached with caution due to its subjective nature.
- The adapted Kirkpatrick model stands out for its robustness and wide application in various research.
- Although gender and age criteria did not show significant differences in the studies, it is crucial to include them in the social aspects to consider.
- Exploring the feasibility of using two evaluation models to compare and obtain more impartial and applicable conclusions for different subsequent studies is suggested.

Despite these advances, the main limitations of the studies lie in the lack of long-term follow-up, which raises questions about the sustainability of the observed effects over time. In this regard, conducting longitudinal studies to assess the durability of observed effects is encouraged.

It is essential to consider the opportunities and challenges related to globalization processes, which influence various aspects of society and the economy. These elements must be integrated into both educational plans and continuing education programs, as they represent a significant challenge for organizations, both public and private.

The relevance of measuring the effectiveness of training and education to understand the potential impact and transfer of educational interventions is emphasized. This evaluation leads to productive improvements in organizations, providing workers with additional tools and motivation. This approach is important considering the considerable investments in training made by both companies and the Chilean government, as highlighted by Giannakos, Mikale, and Pappas (2021).

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