Training Needs Assessment: Where We Are and Where We Should Go

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Abstract

The aim of this article is to systematically review Training Needs Assessment (TNA) scientific literature. Based on two research questions (where are we? where should we go?), we hoped to evaluate the current state of scientific production on TNA and to point out some possible developments. The following databases were consulted: Web of Knowledge, Ovid, Proquest, Wiley Online Library, Emerald, PsycNet, CAPES Database and Scielo. Fifty-One articles were analyzed. The results show that: (a) there is little agreement on how to measure training needs; (b) most of the current TNA models and methods are reactive and do not consider contextual factors and multiple levels of analysis in a proactive way; (c) there are gaps in TNA and a need for theoretical definitions; (d) there is little concern with building theories and concepts related to TNA. Based on these findings, we point out that TNA practice and research should: (a) be based exclusively on measurable human competences gaps, in multiple possible levels of analysis; (b) not focus only on individual professional roles, but also on internal and external contextual factors that can be important in the future; (c) discuss and criticize in depth what work needs, training needs and training needs assessment mean; (d) elaborate and test TNA theories, concepts, models and methods.

Key words: literature review; training needs; work relations; learning at work; personnel management.

Introduction

New workplace demands and requirements are causing major changes in formal education as well as in professional training. Some factors seem to introduce a new scenario for organizations: the rapid pace of technological change in the information society, the increasing content knowledge required for production, the reduction in the product life cycle, and rapidly changing production processes. The need for workers' continuous learning is one of the various effects of these pressures.

In this context, Training Needs Assessment (TNA) processes have a strategic role because they provide clear guidelines as to which professional skill deficiencies must be remedied and what the profile of future trainees should be. For McGehee and Thayer (1961), training needs come from underdeveloped skills, insufficient knowledge or inappropriate worker attitudes. Mager and Pipe (1979) define training needs as identified differences between the employees' current performance and the performance that the organization expects of them.

Training Needs Assessment refers to the organizational process of collecting and analyzing data that supports decision making about when training is the best option (or not) to improve individuals' performances, define who should be trained, and exactly what content should be taught (Clarke, 2003). For Wright and Geroy (1992) TNA should be a systematic process of collection, analysis and interpretation of data on individual, group and/or organizational skill gaps. They should have seven key characteristics: (a) be based mainly on culture and organizational philosophy; (b) be proactive instead of reactive; (c) have a method that permits the distinction between situations that can be addressed through training and those that cannot; (d) allow various organizational actors who are directly or indirectly interested and involved in training to participate; (e) be based on observable skills rather than leaders', managers' and professionals'' perceptions; (f) consider the varied use of sampling techniques and data analysis; and (g) in the end, have a cost/benefit analysis.

However, despite its importance, research shows that training needs diagnoses have been done in an unsystematic manner in organizational settings (Clarke, 2003; Ferreira, Abbad, Pagotto, & Meneses, 2009; Ford & Noe, 1987; McGehee & Thayer, 1961; Moore & Dutton, 1978; Ostroff & Ford, 1989; Taylor, O'Driscoll, & Binning, 1998; Wexley, 1984). There is still relatively little theoretical and empirical research on TNA (Kraiger, 2003). Literature review devoted to the subject is rare. In Management, studies lack systematic theoretical and methodological approaches which may provide consistency to TNA research and practices. We can say that the theoretical and methodological characteristics of TNA scientific knowledge are, somehow, unknown. It seems that much of what was recommended by seminal authors (Mahler & Monroe, 1952; McGehee & Thayer, 1961; Moore & Dutton, 1978, among others) is still not completely incorporated into TNA research and practice.

For over 50 years, Training, Development and Education (TD&E) literature has been concerned with the importance of systematic procedures for TNA and the investigation of internal and external variables that influence or originate needs for training in work contexts (McGehee & Thayer, 1961). However, the scientific production in the area has yet to provide plausible answers to this and other important questions surrounding the topic.

It is precisely in such a theoretical and empirical context that this article is justified. In order to help find possible ways to fill these gaps, it is of great importance to describe the current state of scientific literature on TNA, bringing to light and evaluating the methods and theories employed until today and drawing some possible scenarios to the future. Thus, this article is based on two research questions. Where are we when it comes to the current state of TNA scientific production? Based on the current state of TNA production, where should (or could) research and practice go?

Method

Article selection strategy

The search for articles was initially performed based on literature reviews about TD&E published in the Annual Review of Psychology (Aguinis & Kraiger, 2009; Latham, 1988; Salas & Cannon-Bowers, 2001; Tannenbaum & Yükle, 1992; Wexley, 1984) and reviews published in Brazilian scientific journals (Abbad, Pilati, & Pantoja, 2003; Borges-Andrade & Abbad, 1996), as well as summaries of dissertations and doctoral theses. As to the multilevel evaluation, two seminal texts were consulted: that of Ostroff and Ford (1989) and Koslowski, Brown, Weissbein, Cannon-Bowers and Salas (2000).

The following databases were consulted: Web of Knowledge (ISI), Ovid, Proquest, Wiley Online Library, Emerald, PsycNet (APA), CAPES Database and Scielo. The search for articles occurred in two steps, between the months of February and March 2008 and August and September 2010. The criterion **year of publication** was undetermined, given the research objectives. The key expressions used were: training, training needs analysis, training needs analysis and learning, corporate training and university, training needs assessment, training needs evaluation, training, development and education, learning needs.

The primary criterion established for article selection was that it had to be published in a scientific peer reviewed journal. There were 90 articles, which, after reading the summaries, and assessing the adequacy of the subject, were reduced to 61, of which 51 will be analyzed in this study. Our decision to analyze 51 studies is based on operational questions, like the relationship between the complexity of data analysis, time and workforce. The articles examined in this study are a sample of convenience and do not overstrain the knowledge on TNA.

Criteria and procedures for article analysis

Twelve criteria for analysis of selected articles were determined, as shown in Table 1. The articles were analyzed by the authors and two members of a research group.

Table 1

Selected Articles' Analysis Criteria and Their Definitions

#	Analysis Criteria	Definition
1	Country(ies) of research	Country(ies) in which data collection occurred (if theoretical, the country in which the article was written will be taken into account)
2	Research aim(s)	Main aim(s) of the research
3	Main theoretical and/or empirical question(s)	Issues present in the organizational and academic research contexts
4	Research design	Survey, case study, action research, theoretical
5	Research's nature	Qualitative, quantitative, qualitative/quantitative
6	Instruments and measures	Questionnaire, interview
7	Research field and participants	Location(s) in which data collection occurred and description of participants.

Continues

Table 1 (continued)

#	Analysis Criteria	Definition
8	Independent Variable(s)	Construct(s) that influence other construct(s)
9	Dependent Variable(s)	Construct(s) that is(are) influenced by other construct(s)
10	Procedures for collecting/ analyzing data	Description of procedures for data collection and data analysis techniques
11	Subject Area	Area for application of study
12	Level of analysis	Level of analysis focused on the study (macro = organizational / meso = macro processes, tasks, groups / micro = individual)

Results

We analyzed articles ranging from 1978 to 2010. The scientific literature on TNA experienced considerable quantitative growth between 1990 and 2010. Research in the area remained practically nonexistent in the period 1970 to 1989.

As to the **country(ies)** in which research data was collected, according to Table 2, there is a clear predominance which took place in England (15). There is also a considerable number of studies on TNA in the United States (11).

Table 2

Country(ies) in Which Data Collection Occurred

#. Country(ies)		Number of studies conducted
1.	England	15
2.	United States	11
3.	China	4
4.	Canada	3
5.	Indonesia	2
6.	Transnational	2
7.	**Brazil**	**2**
8.	Greece	2
9.	Kuwait	2
10.	Spain	1
11.	Australia	1
12.	Netherlands	1
13.	Ireland	1
14.	Sri Lanka	1
15.	Turkey	1
16.	Uninformed	2

Table 3 shows the authors, countries, aims, and key research questions.

Table 3

Country(ies), Aims and Main Theoretical and/or Empirical Question(s)

Author(s)	Country(ies) where Research was Conducted	Research Aim(s)	Main Theoretical and/or Empirical Question(s)
Hicks and Hennessy (1997)	England	Evaluate training needs of nurses.	Changes in context and nursing practice. Definition of the role of the nurse.
Al-Khayyat and Elgamal (1997)	Kuwait	Develop TD&E model.	Deficiency of relevant theoretical and methodological approach in the literature.
Anderson (1994)	Australia	Describe challenges to plan and develop educational actions.	Current approaches to TD&E based on traditional models.
Borges-Andrade and Lima (1983)	Brazil	Propose the adoption of a TNA approach. Evaluate training needs of a particular occupational role.	Develop rigorous TNA research and practice. To align needs with strategic goals.
J. Brown (2002)	-	To describe steps for performing an TNA process.	Need to develop rigorous TNA practices and research.
Fan and Cheng (2006)	China	Identify training needs of life insurance salespeople.	Need to conduct an appropriate TNA process for the reality of the organization.
Gould, Kelly, White and Chidgey (2004)	England	To review the TNA literature.	*ad-hoc* TNA research and practices.
Leat and Lovell (1997)	England	Propose an integrated TNA model.	Performance analysis focused only on the individual level.
Miller (2001)	England	To describe the training needs of transnational trade union representatives.	Change in the action context of the union representative (transnational study).
Moore and Dutton (1978)	United States	To review TNA literature.	Little theoretical development of TNA processes. Neglected organizational strategy of the TNA processes.
Reed and Vakola (2006)	Ireland	To investigate how the TNA process can contribute to organizational changes.	Inaccurate decisions by TD&E professionals performing TNA.
Roberson, Kulik and Pepper (2003)	United States	Evaluate needs and design courses for minorities of an organization	Minorities have specific training needs. Emphasis on the fact that organizational level can hide individual needs.

Continues

Table 3 (continued)

Author(s)	Country(ies) where Research was Conducted	Research Aim(s)	Main Theoretical and/or Empirical Question(s)
Sheperd (1995)	England	To describe the importance of the TNA process for nurses.	TNA should take into account changes in the practice of nursing. The literature lacks empirical studies.
Ostroff and Ford (1989)	-	Propose a multilevel approach to TNA	TNA focus on the individual.
Taylor, O'Driscoll and Binning (1998)	New Zeland/ United States	Propose a theoretical TNA model.	Ad-hoc approaches to TNA.
Wright and Geroy (1992)	Canada	Describe the strengths and weaknesses of a TNA process.	Ad-hoc approaches to TNA.
Cowley, Bergen, Young and Kavanagh (2000)	England	To describe the training needs of nurses. Describe the taxonomy of needs.	Changes in legislation imply changes in the practice of nursing.
Asku (2005)	Turkey	To propose an TNA procedure.	The hotel industry does not have rigorous TNA processes.
Alliger, Tannenbaum, Bennett, Traver and Shotland (1997)	United States	To evaluate the relationship of training evaluation variables.	New models for training evaluation are needed.
Bowman and Wilson (2008)	England	To describe the experience of managers who conducted TNA.	TNA process quality relies heavily on the agents who conduct it.
M. Brown and Dodd (1998)	United States	Test the effectiveness of the approach to competitive prices to evaluate training needs.	Changes of context generate training needs. TNA process can support the change.
Burke (1996)	Canada	To compare training needs between hierarchical levels.	Changes in context may generate training needs.
Clarke (2003)	England	To analyze the influence of internal and external context in the process of TNA.	Studies neglect the influence of context on training needs. Social relationships are the primary influence in the TNA process.
Felstead and Ashton (2000)	England	To analyze the impact organizational innovations have on training needs.	Innovative practices generate training needs. There are few systematic studies on TNA.
Gorman, McDonald, Moore, Glassman, Takeuchi and Henry (2003)	United States	To describe an experience of building a skill development model.	External economic crises and new technologies affect the needs for skill development.

Continues

Table 3 (continued)

Author(s)	Country(ies) where Research was Conducted	Research Aim(s)	Main Theoretical and/or Empirical Question(s)
Haccoun and Saks (1998)	Canada	To describe the main contributions of Organizational Psychology for understanding training results.	Individual and contextual variables generate needs for training and affect the outcomes of courses.
Hansson (2007)	Transnational (26 countries)	To examine variables that may cause training needs in different countries.	TD&E processes performed in an unsystematic manner.
Hennessy and Hicks (1998)	England/ Australia/ United States	To test a TNA instrument in the U.S. and Australia.	Reforms in the context of nurses' performance generate training needs.
Markaki, Antonakis, Hicks and Lionis (2007)	Greece	Translate, adapt and validate a TNA instrument in Greece.	Greece has no validated TNA instruments.
Pun and Chin (1999)	China	Compare training needs diagnosed using different methods.	Policies and total quality programs generate new levels of skill demand.
F. W. Brown, Boyle and Boyle (2002)	England	Identify secondary school managers' training needs.	Ad-hoc approaches to TNA.
Skinner, Saunders and Beresford (2004)	England	Describe stakeholder perception of employees' training needs.	To align educational programs and the institutional objective. Stakeholder participation in the TNA process.
Castley (1996)	England	To propose a sectoral approach to evaluate training needs.	The need to develop sectoral TNA approaches in the public sector.
Smallbone, Supri and Baldock (2000)	England	To investigate current and emerging training needs in the printing industry.	Technological changes generate training needs.
While, Ullman and Forbes (2007)	England	Develop and validate a TNA scale.	Lack of TNA tools.
Erffmeyer, Russ and Hair (1991)	United States	Describe how TNA has been used in TD&E processes.	Little importance is given to the TNA processes in organizations.
Petridou and Spathas (2001)	Greece	Evaluate training needs based on personal and professional characteristics.	Need to consider individual variables to assess training needs.
Supino and Richardson (1999)	United States	To describe university managers' and academics' perceptions of training needs.	The need to map leaders' and medical students' perceptions of their training needs.
Holton, Bates and Naquin (2000)	United States	To develop and implement a TNA method in the public sector.	Ad-hoc approaches to TNA. Employee participation in the TNA process is crucial.

Continues

Table 3 (continued)

Author(s)	Country(ies) where Research was Conducted	Research Aim(s)	Main Theoretical and/or Empirical Question(s)
Magalhães and Borges-Andrade (2001)	Brazil	To develop a TNA method that includes attitudes. To study the relationship between self and peer-based TNA evaluations.	Lack of studies comparing self and peer-based TNA evaluations.
Versloot, de Jong and Thijssen (2001)	Netherlands	To study the characteristics of organizational contexts that favor each type of training.	There are few studies on the relationship between organizational context and the training offered.
Wickramasinghe (2006)	Sri Lanka	To examine TNA practices	Ad-hoc approaches to TNA.
Hennessy, Hicks, Hilan and Kawonal (2006)	Indonesia	Validate an instrument to evaluate nurses' training needs.	The poor definition of nurses' roles creates confusion about the actual training needs.
Hennessy, Hicks and Koesno (2006)	Indonesia	To evaluate midwives' training needs.	The low number of midwives to meet the demand in Indonesia has generated extra work and poor quality in services.
Blunch and Castro (2007)	United States	To identify training needs based on productivity and organizational climate.	Emerging technologies and other context variables can generate training needs.
Tao, Yeh and Sun (2006)	China	To demonstrate how web-based technologies can contribute to the TNA process.	Need for approaches to assess training needs via the Web.
Devitt and Murphy (2004)	England	To evaluate doctors' training needs.	Needs to validate TNA methods directed toward doctors' performances.
Al-Khayyat (1998)	Kuwait	Propose a TNA model	Ad-hoc approaches to TNA.
Lareki, Morentin and Amenabar (2010)	Spain	To address faculty members' learning needs.	Lack of information on faculty members' actual needs and the type of format that should be utilized for training.
Kaskutas *et al.* (2010)	United States	Conduct a needs assessment to determine gaps in the school-based apprentice carpenters' fall prevention training.	Falls from heights in residential construction are common, especially among inexperienced workers.
Taormina (2009)	China	Address two research gaps in the literature between employee needs and organizational socialization.	Lack of empirical study on TNA.

Table 4 shows the overall results according to design, nature and instruments.

Table 4

Design, Nature and Instruments of TNA

Author(s)	Research Design	Nature of Research	Instruments
Hicks and Hennessy (1997)	Survey	Quantitative	Questionnaire
Al-Khayyat and Elgamal (1997)	Survey	Quantitative	Questionnaire
Anderson (1994)	Theoretical	-	-
Borges-Andrade and Lima (1983)	Survey	Qualitative /Quantitative	Questionnaire
J. Brown (2002)	Theoretical	-	-
Fan and Cheng (2006)	Survey	Qualitative / Quantitative	Interviews and Questionnaire
Gould *et al.* (2004)	Theoretical	-	-
Leat and Lovell (1997)	Theoretical	-	-
Miller (2001)	Survey	Qualitative /Quantitative	Questionnaire
Moore and Dutton (1978)	Theoretical	-	-
Reed and Vakola (2006)	Action Research	Qualitative	Interviews and Questionnaires
Roberson *et al.* (2003)	Theoretical	-	-
Sheperd (1995)	Theoretical	-	-
Ostroff and Ford (1989)	Theoretical	-	-
Taylor, O'Driscoll and Binning (1998)	Theoretical	-	-
Wright and Geroy (1992)	Case Study	Qualitative	-
Cowley *et al.* (2000)	Case Study	Qualitative	Questionnaire
Asku (2005)	Survey	Qualitative / Quantitative	Questionnaires
Alliger *et al.* (1997)	Theoretical	Quantitative (Meta-Analysis)	-
Bowman amd Wilson (2008)	Survey	Qualitative	Interviews and Questionnaires
M. Brown and Dodd (1998)	Survey	Quantitative	Questionnaire
Burke (1996)	Survey	Qualitative / Quantitative	Questionnaire
Clarke (2003)	Survey	Qualitative / Quantitative	Questionnaires
Felstead and Ashton (2000)	Survey	Qualitative /Quantitative	Interviews and Questionnaires
Gorman *et al.* (2003)	Action Research	Qualitative / Quantitative	Questionnaire
Haccoun and Saks (1998)	Theoretical	-	-

Continues

Table 4 (continued)

Author(s)	Research Design	Nature of Research	Instruments
Hansson (2007)	Survey	Quantitative	Questionnaire
Hennessy and Hicks (1998)	Survey	Quantitative	Questionnaire
Markaki *et al.* (2007)	Survey	Quantitative	Questionnaire
Pun and Chin (1999)	Survey	Qualitative / Quantitative	Interviews and Questionnaire
F. W. Brown *et al.* (2002)	Survey	Qualitative	Interviews
Skinner, Saunders and Beresford (2004)	Survey	Qualitative	Interviews and Questionnaires
Castley (1996)	Theoretical	-	-
Smallbone *et al.* (2000)	Survey	Qualitative	Interviews
While *et al.* (2007)	Survey	Qualitative / Quantitative	Interviews and Questionnaire
Erffmeyer *et al.* (1991)	Survey	Quantitative	Questionnaire
Petridou and Spathis (2001)	Survey	Quantitative	Questionnaire
Supino and Richardson (1999)	Survey	Quantitative	Questionnaire
Holton *et al.* (2000)	Action-Research	Qualitative	Interview
Magalhães and Borges-Andrade (2001)	Survey	Quantitative	Questionnaire
Versloot *et al.* (2001)	Survey	Qualitative	Questionnaires
Wickramasinghe (2006)	Survey	Qualitative / Quantitative	Interviews and Questionnaire
Hennessy, Hicks, Hilan, *et al.* (2006)	Survey	Quantitative	Questionnaire
Hennessy, Hicks and Koesno (2006)	Survey	Quantitative	Questionnaire
Blunch and Castro (2007)	Survey	Quantitative	Questionnaire
Tao *et al.* (2006)	Survey	Qualitative	Interviews and Questionnaire
Devitt and Murphy (2004)	Survey	Quantitative	Questionnaire
Al-Khayyat (1998)	Case Study	Qualitative / Quantitative	Questionnaire
Lareki *et al.* (2010)	Survey	Qualitative / Quantitative	Questionnaire
Kaskutas *et al.* (2010)	Survey	Qualitative / Quantitative	Interviews and Questionnaire
Taormina (2009)	Survey	Quantitative	Questionnaire

Table 5 displays the research fields, participants, procedures, levels of analysis and area results.

Table 5

Research Field, Participants, Procedures, Level of Analysis and Area

Author(s)	Research Field/ Participants	Collection Procedures/ Data Analysis	Level of Analysis	Area
Hicks and Hennessy (1997)	Public Hospital Sector. 420 nurses.	Questionnaire sent and returned by mail. ANOVA.	Micro	Medicine
Al-Khayyat and Elgamal (1997)	9 Banks. 387 subjects.	Printed questionnaire. t-test, correlation, regression.	Macro	Management
Anderson (1994)	-	-	-	Education
Borges-Andrade and Lima (1983)	Public Agricultural Technology Company.	Self-administered printed questionnaire (in person and by mail).	Micro	Psychology
J. Brown (2002)	-	-	-	Management
Fan and Cheng (2006)	Subsidiary life insurance companies. 10 subjects.	Delphi technique. Content analysis. Wilcoxon Signed Rank test.	Micro	Management
Gould *et al.* (2004)	-	-	-	Medicine
Leat and Lovell (1997)	-	-	-	Management
Miller (2001)	Unions in Italy, Holland, England, and Belgium. 100 subjects.	Questionnaire sent by Internet. Content analysis. Average, Standard deviation, minimums and maximums.	Micro	Management
Moore and Dutton (1978)	-	-	-	Management
Reed and Vakola (2006)	Public health clinics. 632 subjects.	Research inside the organization. Collective interviews. Content analysis.	Meso	Management
Roberson *et al.* (2003)	-	-	-	Psychology
Sheperd (1995)	-	-	-	Medicine
Ostroff and Ford (1989)	-	-	-	Psychology
Taylor, O'Driscoll and Binning (1998)	-	-	-	Management
Wright and Geroy (1992)	Public TD&E business	Telephone interview.	-	Management
Cowley *et al.* (2000)	Public health organization. 23 subjects.	Observation. Semi-structured interview.	-	Medicine
Asku (2005)	Private hotel. 114 subjects.	Self-administered printed interview. One week to respond. Average, Standard deviation, frequency.	Micro	Management
Alliger *et al.* (1997)	-	Bibliographic research on the Internet. Correlation of averages. Confidence interval.	-	Psychology

Continues

Table 5 (continued)

Author(s)	Research Field/ Participants	Collection Procedures/ Data Analysis	Level of Analysis	Area
Bowman and Wilson (2008)	Transportation business.	Self-administered printed interview. Personal interviews.	-	Psychology
M. Brown and Dodd (1998)	Agricultural cooperative. 36 subjects.	Self-administered face-to-face interview. t-test, correlation of averages.	Macro	Management
Burke (1996)	Private services business. 1608 subjects.	Secondary data. Frequency.	Meso	Management
Clarke (2003)	Public social organization. 59 subjects.	Self-administered and printed interviews. Focal groups and individual interviews. Content analysis, Mann-Whitney test (Z), significance test, Average, Standard deviation.	Meso	Management
Felstead and Ashton (2000)	2,224 subjects from various parts of the UK.	Questionnaires sent by mail. Semi-structured interviews by telephone. Content analysis, multivariate statistics.	Macro	Management
Gorman et al. (2003)	Los Angeles City Hall. 162 subjects.	Focus groups. Semi-structured face-to-face interviews. Closed printed questionnaires. Correlations (within), combined SAS linear model, maximum restricted probability (REML).	Meso	Management
Haccoun and Saks (1998)	-	-	-	Psychology
Hansson (2007)	5,824 private companies in 26 countries.	Regression, t-test, residual analysis.	-	Management
Hennessy and Hicks (1998)	Public and private hospitals. 216 subjects.	Questionnaires sent by mail. ANOVA.	Micro	Medicine
Markaki et al. (2007)	55 subjects from various medical areas.	Questionnaires sent by mail. Test of internal consistency, kappa cohen, oblique rotation (varimax), Bartlett's Test.	Micro	Medicine
Pun and Chin (1999)	130 organizations from Hong Kong.	Questionnaires sent by mail. Levene's test, t-test.	Micro	Management
F. W. Brown et al. (2002)	21 public and private schools.	Semi-structured face-to-face interviews. Focus groups. Content Analysis.	Micro	Education
Skinner et al. (2004)	31 subjects.	Focus groups. Content analysis.	Macro	Management

Continues

Table 5 (continued)

Author(s)	Research Field/ Participants	Collection Procedures/ Data Analysis	Level of Analysis	Area
Castley (1996)	-	-	-	Management
Smallbone *et al.* (2000)	39 small and medium businesses. 35 subjects.	Semi-structured face-to-face interviews. Focus groups. Content analysis.	Macro	Management
While *et al.* (2007)	420 subjects from various regions of the UK (workers and stakeholders).	Questionnaires sent by mail. Focus groups. Semi-structured face-to-face interviews. Content analysis, Kendall Tau, internal consistency, correlation within groups.	Micro	Medicine
Erffmeyer *et al.* (1991)	American Society of TD&E. 93 subjects.	Questionnaires sent by mail. Average, frequency.	Meso	Marketing
Petridou and Spathis (2001)	444 public servants.	Printed self-administered face-to-face questionnaire. Stepwise logistic regression.	Meso	Management
Supino and Richardson (1999)	677 subjects.	Questionnaires sent by mail. Fisher's exact, Kruskal-Wallis and Mann-Whitney, U test	Meso	Medicine
Holton *et al.* (2000)	About 2,000 public servants in two U.S. states	Questionnaires sent by mail, in person and phone interviews. Content analysis, descriptive and inferential statistics (not specified)	Macro	Public Management
Magalhães and Borges-Andrade (2001)	370 subjects from a public banking institution.	Printed questionnaires sent by mail. Factor analysis, varimax rotation, internal consistency, t-test, Pearson correlation (two-tailed).	Meso	Psychology
Versloot *et al.* (2001)	7 private service providing organizations.	Semi-structured face-to-face interviews. Content analysis.	-	Education
Wickramasinghe (2006)	219 organizations.	Questionnaires sent by mail. ANOVA, chi-square.	Macro	Management
Hennessy, Hicks, Hilan, *et al.* (2006)	856 subjects from various public health institutions.	Document analysis, face-to-face interviews, self-administered questionnaires. Factor analysis, varimax.	Micro	Medicine
Hennessy, Hicks and Koesno (2006)	332 subjects from different public health institutions.	Printed questionnaire self-administered in person. Factor analyses, varimax, ANOVA.	Micro	Medicine
Blunch and Castro (2007)	Organizations from 5 countries (not specified)	Questionnaires sent by mail.	Macro	Economy

Continues

Table 5 (continued)

Author(s)	Research Field/ Participants	Collection Procedures/ Data Analysis	Level of Analysis	Area
Tao *et al.* (2006)	-	Content analysis	-	IT / Management
Devitt and Murphy (2004)	Senior and junior doctors.	Mann-Whitney test.	-	Medicine
Al-Khayyat (1998)	Members of the banking studies institute.	There are no details in the article.	Micro	Management
Lareki *et al.* (2010)	University of the Basque Country. 472 faculty members.	Questionnaires sent by the intranet. Factorial analysis, Pearson's Test.	Micro	Education
Kaskutas *et al.* (2010)	St. Louis Carpenters' Joint Apprenticeship Program. 1061 subjects.	Focus groups, observation, questionnaire. Content analysis, average, frequency.	Micro	Management
Taormina (2009)	Organizations in Hong Kong. 156 subjects.	Printed questionnaires. Correlation, regression, SEM.	Macro	Management

Table 6 presents the independent and dependent variables used in research sample.

Table 6

Independent and Dependent Variables Used in TNA Research

Author(s)	Independent Variable(s)	Dependent Variable(s)
Al-Khayyat and Elgamal (1997)	Clarity of mission in the area of Personnel Development. Resource allocation. Personnel Development Policies. Managers' attitudes	TNA, Instructional Design, Training Implementation, Training evaluation (independent related to →) employee satisfaction, performance, productivity
Felstead and Ashton (2000)	Organizational characteristics: total quality programs, formal evaluation systems, investment in personnel, organization of meetings, freedom of expression granted to employees.	Individual skills: problem solving, communication, teamwork.
Hansson (2007)	Organizational characteristics: training policies, union action, employees over the age of 45, employees with university degrees, size.	Organizational characteristics: TD&E expenses, number of trained employees.
Petridou and Spathis (2001)	Individual characteristics: gender, age, education, attitude towards training, hierarchy level and time on the job.	Type of training offered to individuals.
Blunch and Castro (2007)	Organizational characteristics: have ISO 9000 or 14000 certification	Organizational characteristics: training implementation, trained employees.
Taormina (2009)	Employees' Manifested Needs	Organizational Socialization, Organizational Culture

Discussion

Keeping in mind our research questions and objectives and the recommendations by Baumeister and Leary (1997), we present the discussion as follows.

TNA: where are we?

This section is dedicated to show where our analysis suggests TNA scientific knowledge currently is, in methodological and theoretical terms. Our recommendations about what to do (where to go) given such results are presented in the next section. In sum, one can say that TNA approaches (in practice and research) had a considerable methodological advancement in past decades, shifting from ad-hoc frameworks (Clarke, 2003; Ferreira *et al.*, 2009; Ford & Noe, 1987; McGehee & Thayer, 1961; Moore & Dutton, 1978; Ostroff & Ford, 1989; Taylor *et al.*, 1998; Wexley, 1984) to a more professional and scientific basis. But there are still several methodological weaknesses and a very long path to move forward in theoretical terms. It is also important to say that TNA research experienced a great growth in publications in the last two decades, especially in the 2000's (Kraiger, 2003).

Regarding the main research questions, one can say that **the analyzed studies aimed**, primarily, to respond:

. How can one respond to workers' qualification needs?

. How can one systematize and operationalize TNA processes and practices?

. How can one identify and measure training needs?

. What are the possibilities and limitations of practice, research and current TNA models?

As to the **theoretical and empirical issues investigated**, it can be said that most studies aimed at addressing one or more of the following:

. Diagnose training needs for professionals;

. Describe challenges for TNA practice;

. Describe weaknesses in current TNA approaches;

. Describe/propose TNA procedures;

. Construct TNA instruments.

It seems that TNA practice and research still have an almost exclusively diagnostic/procedural and reactive focus, concerning **how to do it in the present**. Apparently, prospective TNA approaches, based on literature on competence and competences management (Boyatzis, 1982; Cockerill, 1989; McClelland, 1973; Prahalad & Hamel, 1990; Sparrow & Bognanno, 1994), are still rare. Research are mainly applied, investigating methodological or practical problems and solutions related to TNA systems. This is of great value, but there is still a critical lack of theory development and/or evaluation. Still, there is no apparent concern with developing organizational policies on TNA. Some important theoretical issues that are almost absent in the studies are: the relationships between the TNA concepts, work needs, and competence or competences management based on future scenarios (Sparrow & Bognanno, 1994); the missed conceptual link between individual and organizational needs; and to propose new kinds of needs, as learning needs, educational needs, development needs, avoiding practices and research to be dependent on only one kind of possible instructional solution to meet competence gaps (training).

Methodologically, it is possible to note the prevalence of survey-type studies (34.63%). Eleven (11) theoretical essays, three (3) case studies and three (3) action research studies were also obtained. There is a relative predominance of quantitative studies (20). Mixed studies (qualitative/quantitative) and qualitative data showed moderate frequency (11 and 10, respectively). There is also a relative dominance of questionnaires as data collection instruments (26.49%). Some research (9) used questionnaires and interviews, which suggests consonance with qualitative/quantitative studies. Four (4) studies reported using only interviews. Thirteen (13) research theoretical reports were not subject to this analysis criterion. The methodological diversity of scientific knowledge on TNA must be prized (Baumeister & Leary, 1997). The use of multiple data collection methods (*e.g.* questionnaire, interviews, focus groups) and analysis (*e.g.* content analysis, descriptive and inferential statistics) is highly desirable to investigate complex phenomenon, as in the social and behavioral sciences. On the other hand, we can note that this methodological diversity is accompanied by a high diversity in results and conclusions as well, even regarding the same object (training needs at work). There is no convergence of results: some authors define training needs as a occupational competence gap (*e.g.* Borges-Andrade & Lima, 1983); others understand it as a performance gap at multiple levels (*e.g.* Asku, 2005); and others suggest it being the number of vacancies in an organizational sector (*e.g.* Castley, 1996). Therefore, we do not know if the methods are flawed, the object is too complex, or both (or even none of these). We risk saying that this area of knowledge is still seeking its object (consequently, the way(s) to theorize and measure it).

The research design most commonly employed in the analyzed studies also deserves attention. Survey-type studies, descriptive or correlational, and with purposive samples imply a series of limitations regarding external validity, generalization, inference robustness, and conclusion validity (among others). In practical terms (to managers' decision-making), this may be a minor problem, but, in scientific terms, we should look at this more carefully. As soon as we do not have robust research designs in the area (*e.g.* experimental or quasi-experimental), it is hard to separate what is the phenomenon *per si* (training needs at work), its antecedents and consequents, and what are methodological flaws.

As for the **levels of analysis**, in most studies (19) the question of levels does not apply, because the author did not argue or discuss such a question. There is a relative predominance of studies that investigated the micro level of TNA (16). In relation to the meso and macro levels, there are a balanced number of studies (8). It seems that in Management research focus is on the macro level of analysis, while in Psychology there is a shift to the micro level. These results contradict the findings of Chiu, Thompson, Mak, and Lo (1999), who said that the most studied level of analysis was macro (organizational), followed by the meso (groups, tasks and processes), with the individual being the least studied. Otherwise, it is clear that multilevel analysis and modeling is still a neglected technique when it comes to TNA practice and research, even with clear indications that theory and data in this area can have a hierarchical structure (Koslowski, Brown, Weissbein, Cannon-Bowers, & Salas, 2000; McGehee & Thayer, 1961; Mossholder & Bedeian, 1983; Ostroff & Ford, 1989), which is recommended by multilevel literature as a premise to use such methods (Hox, 2010; Hox & Roberts, 2011; Kreft & De Leeuw, 1998; Raubendush & Bryk, 1986; Snijders & Bosker, 1994).

Regarding the **area**, there is a predominance of studies in Management (25), followed by studies applied to Medicine (11) and Psychology (7). Others areas also include TNA techniques, Education, Public Management, Marketing and Information Technology. This is quite interesting and shows that needs at work is a multi/inter/trans-disciplinary research object, being of interest to multiple knowledge fields. Perhaps this justifies the field's theoretical and methodological diversity.

Regarding the **independent and dependent variables**, few studies (6 out of 51) aimed to correlate variables, which is a measure adopted for testing models and hypotheses. Some independent variables were: clarity of mission in the area of personnel development, presence of total quality programs, level of investment in personnel development. Some dependent variables were: TNA, instructional design, employee satisfaction, productivity, communication, TD&E expenditures. Methodologically, these were quantitative and survey-type studies, with purposive samples, using questionnaires. All studies report significant relationships between the variables of interest. An

important result is that training policies are positively related to training needs, showing how important is for organizations to have policies devoted to training and learning (Hansson, 2007). But is important to affirm that these results can have several alternative explanations, since the methods employed do not permit causality inferences (Baumeister & Leary, 1997).

TNA: where should (or could) we go?

According to the TNA strengths and weaknesses in practice and research presented earlier, we have a rich research agenda that could be structured.

First, TNA initiatives should have a broader and more proactive focus, shifting from exclusively reactive and diagnostic to a theory development and review framework. The issue on whether a competence gap should be faced by training or others types of instructional events (such as development, instruction, education or even informal learning at work) has not yet been discussed. It seems inappropriate to define *a priori* that a competence gap necessarily signifies a training need. We suggest that another types of needs should be discussed, such as learning needs, educational needs, development needs, among others. A deep theoretical and epistemological refinement of needs at work concepts and methods could achieve such an agenda.

It is also important that TNA practice and research do not focus only on present competences related to professional roles (Borges-Andrade & Lima, 1983), but also on emerging competences that can be important to the organization in the future (Felstead & Ashton, 2000). Besides promoting training events with higher probabilities of positive impact at work, this would also allow the development of long-term training and TNA policies, which, by the way, is neglected in the studies analyzed. Still, concerning competences, we noted that there is no consensus about it as the only construct that permits investigating training needs. This is of great concern since training investment decisions are being made based on a diversity of indicators that depend more on the context and less on the individual (Asku, 2005; Castley, 1996), constituting, in fact, other types of needs than training. Thus, we suggest that the literature on competence and competences management (Boyatzis, 1982; Cockerill, 1989; McClelland, 1973; Prahalad & Hamel, 1990; Sparrow & Bognanno, 1994) should be used as a primary resource for TNA practice and research, assuming that (gap of) competences are the only way to investigate human training needs at work.

Methodologically, we can say that TNA practice and research has advanced in the past decades, employing scientific techniques to develop instruments (Hennessy & Hicks, 1998), proposing TNA models (Al-Khayyat & Elagamal, 1997) and being marked by methodological diversity, for example. However, TNA current methods still present flaws, as we showed earlier. First of all, we should have more mixed techniques, based on qualitative and quantitative data simultaneously (While, Ullman, & Forbes, 2007). Research and practice should also utilize a more heterogeneous and probabilistic sample, avoiding questioning only top managers, and including randomly chosen employees at different levels. This would allow triangulation of evidence, highly important to scientific and professional decision-making. Secondly, studies, especially TNA research, should employ more robust designs, such as quasi-experimental or experimental studies. This would allow for a more reliable set of conclusions about whether or not to invest in training and would help to improve TNA theories and concepts.

Regarding level of analysis, the adoption of multilevel modeling in TNA research is urgent. Since 1950, several studies have suggested that TNA theory and data can have a hierarchical arrangement (Koslowski *et al.*, 2000; McGehee & Thayer, 1961; Mossholder & Bedeian, 1983; Ostroff & Ford, 1989). Nevertheless, current practice and research neglects to discuss this issue. Research should be based in at least three levels and their respective variables, followed with statistical multilevel regression analysis: internal and external organizational contexts (as laws, technology, politics, structure); organizational area or unit characteristics (number of employees, training budget, organizational level); and individual characteristics (training needs, competences

domains, age, education, learning style). In this scenario, we could more deeply investigate needs antecedents and consequents and needs definitions between levels (including groups of individuals).

Regarding areas of application, TNA must continue to expand. We can suggest that TNA is applicable to several areas of knowledge, as our results indicated. Wherever one is interested in professional education planning and executing, TNA approaches can be employed (technology, medicine, management, marketing, mental health, education, psychology). Perhaps, this is why TNA is such an interesting and exciting theme.

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