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PRIMARY RESEARCH

Training, knowledge, competence, performance: What is the relationship?

Kristina Sisyuk *

International Business Research, University of Salzburg Business School, Salzburg, Austria

Keywords

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Abstract

This research aims to analyze available theories on investment in-company training, knowledge and competence formation, and performance of employees in the workplace and explore empirical relations between these four variables. This research is exploratory and interpretative in nature. It is based on conclusions from the analysis of the existing theoretical literature and empirical studies conducted from 1962 to 2018 and related to the variables "in-company training," "knowledge," "competence," and "employee performance in the workplace." The findings show that the theoretical and methodological diversity of analyzed theories and empirical studies is quite large yet still limited. Numerous scientists have tried to explain relations between "training" and "employee performance" and operationalize the latter. However, the relations and interdependencies between in-company training, knowledge, competence, and performance of employees in the workplace have rarely, if ever, been explored thus far, and the economic efficiency of in-company training continues to be among the unknowns. This first stage will develop a theoretical framework for empirical research on the relationship between in-company training, knowledge, competence, and performance of employees in the workplace. The resulting findings will have academic relevance and significant practical relevance to design results-oriented learning strategies at companies.

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INTRODUCTION

Volatility, Uncertainty, Complexity and Ambiguity (VUCA) characterize the environment of knowledge-intensive organizations today. The market and customer requirements regarding innovation, quality, financial services and flexibility are increasing constantly. The "survival of the fittest" demands those organizations act as living organisms and adapt to environmental changes. It is no longer sufficient for them to think that the employees' competencies at the time of recruitment will meet future demands. New technologies are rapidly transforming job landscapes and reshaping the way people work within organizations.

In 2015, at the World Innovation Summit for Education, the results of the Lumina study on higher education in the United States were presented. One of the findings was that 89% of business leaders did not agree with the statement that "higher education institutions in this country are educating students with skills and competencies that my business needs" (Gallup, 2014; Ozyurek & Uluturk, 2016). What is crucial for organizations is not who is the most proficient in designing a drawing or making a competitor analysis but instead, the social competencies an employee possesses are what matter most (Bhalerao, 2016; World Economic Forum, 2016).

One of the world's leading technology companies, Siemens AG, has recorded since 2009 a training investment growth of 16%. In 2017, it amounted to 266 million euros, an average of 735 euros per employee (Siemens, 2018). A leading Australian resource company, BHP, provided on average 43 hours of training to each employee in 2017 (BHP, 2017). In Gazprom, the largest producer and exporter of liquefied natural gas from Russia, 73% of employees were trained under enhancement and retraining programs in 2017 (Gazprom, 2017). It is estimated that corporations

*corresponding author: Kristina Sisyuk
†email: kristina.sisyuk@yahoo.de

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spent in 2017 around 362 billion US dollars on corporate training activities worldwide (Statista, 2018).

In addition to companies, also political, economic and social institutions underline the economic importance of continuous training. The fourth sustainable development goal of the United Nations of the 2030 Agenda for Sustainable Development aims to "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (United Nations Educational, Scientific and Cultural Organization, 2017). Education and training also receives paramount attention in the European 2020 strategy. The target is 15% for adult participation in lifelong learning (European Commission, 2013).

This behaviour raises the following question: Is in-company training a truly sound "investment" which leads to higher employee performance, or is it more a "luxury good" with a cost disproportionate to its positive impact? To answer the research question, the paper is divided into five sections. The second section describes the chosen methodological approach. The third section presents a review of the theoretical concepts related to four variables: in-company training, knowledge and competence formation, and employee performance in the workplace. The fourth section demonstrates an analysis results of existing empirical studies on effects of in-company training. Conclusions and a future research proposal on the relationship between the four variables are performed in the fifth section.

LITERATURE REVIEW

This chapter explores the trail of human capital theorization from a microeconomic perspective as a part of economic theory. It focuses on explanation of the variables "in-company training", "knowledge", "competence" and "employee performance in the workplace". Consequently, it examines the related gaps and issues in theoretical literature.

Training as an Aspect of Human Capital

Chicago School representatives, (Becker, 1993; Mincer, 1962; Schultz, 1961, 1972), integrated the Human Capital Theory into economic analysis and developed it substantially. The focus of their analyses was related to the microeconomic approach and targeted to the investment in human beings, e.g., in knowledge acquisition through training. This kind of investment involves costs and benefits and can, therefore, be elaborated under investment-theoretical aspects as economic decisions.

Mincer´s analysis was related, inter alia, to the allocation of resources to training. He used his research results to explain the earnings inequality and behavior of different groups of workforces (Mincer, 1962). Related to earnings inequality, he concluded that "the inequality in the distribution of earnings is affected primarily by the dispersion in the amounts of human capital invested and by the average magnitude and the dispersion in the rates of returns" (Mincer, 1975). The results of his analysis led to the conclusion that a more educated workforce receives higher wages and enjoys higher employment stability than a less educated workforce (Mincer, 1975).

Schultz perceived that training is an investment in human capital that leads to higher future income (Schultz, 1961). He focused on five categories of investment in human capital: health services, training organized by firms on the job, formally organized education, study programs for adults not organized by firms and migration (Schultz, 1961). The results of his analyses were that all these investments improve skills, knowledge and health, and thereby raise income level (Schultz, 1972). In his later research, Schultz noted some of the limitations of his previous work as well as unrealistic assumptions of neo-classic theory such as perfect competition (Schultz, 1972).

Like Schultz, Becker considered human capital as a product of investment in education, training, etc (Becker, 1993). In addition, he provided a distinction between general and specific human capital in order to conduct more specific analyses on investment in on-the-job training. According to his theory, a rationally operating company will only invest in company-specific human capital, because it can be used profitably more in this company than in others. Becker´s research showed that more highly educated and skilled persons almost always tend to earn more than others. However, his statement is not universal and there are differences between developed and underdeveloped countries (Becker, 1993). In addition, Becker observed that investment in human capital leads to increased employee productivity and this, in turn, results in an improved income situation. This observation was related to the United States and assumptions were based on perfectly competitive labor markets and instruments (Becker, 1993; Chong & Lee, 2017; Karim, Elyas, Mahmood, & Hossein, 2017; Kurniawati & MeilianaIntani, 2016). Conversely, Acemoglu and Pischke, demonstrated that a company can have an interest in investing in general human capital. The reasons for this are asymmetric information, complementarity of general and specific human capital, etc (Acemoglu & Pischke, 1998).

Training as a component of human capital was defined by a number of authors and to emphasis the diversity of definitions, some of them are presented in the Table 1.

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TABLE 1. Selected definitions of training

Source	Definition of Training	Key Aspects
Mincer (1962)	"[...] process of capital formation in people". Mincer counted under training schooling, formal and informal on-the-job training and learning from experience.	Formatting capital
Winterton (2007)	"The objective of training is to ensure that all employees have and maintain the requisite competencies to perform in their roles at work".	Maintaining competencies
Cascio and Aguinis (2011)	"[...] activities directed toward the acquisition of knowledge, skills, and attitudes for which there is an immediate or near-term application [...]".	Acquiring knowledge, skills, attitudes
Noe, Hollenbeck, Gerhart, and Wright (2007)	"An organization´s planned efforts to help employees acquire job-related knowledge, skills, abilities, and behaviors, with the goal of applying these on the job".	Acquiring knowledge, skills, abilities, behaviors

Despite differences in definitions, all of them imply that training is a systematic process which targets outcomes in knowledge, skills, abilities, competence, behavior and attitudes.

In line with the research question, the focus lies on a particular component of human capital, which is accumulated during market participation through "in-company training".

Knowledge as a Component of Human Capital

The question on importance of knowledge has occupied much attention in economic and management theory. In economic theory, (Hayek, 1945; Schumpeter, 1991), elaborated on the economic role of knowledge. Hayek argued that knowledge is largely tacit and acquired through practice, and hence different people have different knowledge despite obtaining the same data and information. He considered knowledge as highly subjective and not separable from individuals who possess it (Hayek, 1945). Schumpeter emphasized the cruciality of explicit knowledge combination and referred to the creative role of knowledge in innovations. He defined innovation as an entrepreneur´s doing of something new or doing something in a new way (Schumpeter, 1991).

Drucker (1999), Nonaka and Takeuchi (1996), North and Kumta (2018) considered the essential role of knowledge in their management theories. Drucker stepped into the shoes of Schumpeter by elaborating further on knowledge-based innovations. He described this type of innovation as the crème de la crème of entrepreneurship and reasoned that knowledge workers need to learn continuously and acquire new knowledge to be innovative (Drucker, 1999). Table 2 shows some selected definitions of how is knowledge defined.

TABLE 2. Selected definitions of knowledge

Source	Definition of Knowledge	Key Components
Nonaka and Takeuchi (1996)	"[...] a dynamic human process of justifying personal belief toward the "truth"".	Personal beliefs
Drucker (1999)	"[...] knowledge is the ability to apply information to specific work and performance".	Information
Davenport, Prusak, et al. (1998)	"Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers [...]".	Experiences, values, information, insights
Syďanmaanlakka (2002)	"[...] is a mixture of organized experiences, values, information and insights offering framework for the evaluation of new experiences and information".	Experiences, values, information, insights

The provided definitions describe various elements of knowledge and show with this that knowledge is not a simple one-dimensional element. In addition, to those definitions, Polanyi deeply analyzed tacit and explicit knowledge dimensions. "[...] tacit knowing is the fundamental power of the mind which creates explicit knowing, lends meaning to it and controls its uses" (Polanyi, 1966). He concluded that there is no clear separation between tacit and explicit knowledge, but the tacit dimension is a crucial fraction of all knowledge. "[...] all knowledge is either tacit or rooted in tacit knowledge" (Polanyi, 1966)

According to the Nonaka´s and Takeuchi´s theory, knowledge is created through interaction between the tacit and explicit dimensions. Authors determined 4 knowledge con-

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versation processes: socialization, externalization, internationalization and combination. Socialization is the process of creating tacit knowledge through experience, e.g., an employee can acquire tacit knowledge through training. Externalization is a process of transforming tacit knowledge into the explicit dimension. For example, by using the tacit knowledge, employees may create new product designs. Internalization is the process of knowledge conversation from explicit to tacit. Through internalization, employees are capable of using knowledge they have experienced to build new concepts. Combination is the process of combining different forms of explicit knowledge together. Within organizations it can occur when employees exchange documents (Nonaka & Takeuchi, 1996).

To explain knowledge-based value creation within an organization, North and Kumta developed "The Knowledge Ladder". It visualizes clear interrelation for terms like symbols, data, information, knowledge, action, competence and competitiveness and shows how knowledge is related to competence. The authors differentiate between three levels of knowledge: "know what", "know why" and "know how". "Know what" is the result of information internalization, e.g., through participation in training. "Know how" is the result of transformation of "know what" through application. "Know why" is specific motives to apply knowledge (North & Kumta, 2018). The focus of this research is tacit and explicit knowledge acquisition by employees through in-company training, which is considered as a transfer mechanism.

Competence as a Component of Human Capital

The competence perspective on individual level was investigated by (Boyatzis, 1982; North & Kumta, 2018; North, Reinhardt, & Sieber-Suter, 2018). In his book "The Competent Manager", Boyatzis, argued that companies need competent managers in order to achieve their targets. North et al. elaborated on development of individual competencies within an organization and created a practical guideline how systematically to identify, to utilize and develop employees' competencies. Table 3 demonstrates some selected definitions of competence which underlie the existing differences in their terminology.

TABLE 3. Selected definitions of components

Source	Definition of competence	Key Components
Boyatzis (1982)	Boyatsis called the characteristics of an employee which contribute to their performance as competencies.	Employee characteristics
Syďanmaanlakka (2002)	"Competence consists of knowledge, skills, attitudes, experiences and contacts. Processes, ways of working and culture are included in organizational competence".	Behavior
Winterton (2007)	"Competence embraces the ability".	Ability
North and Kumta (2018)	"[...] relationship between the tasks assigned to or assumed by the person or the group and their capability and potential to deliver a desired performance. People mobilise knowledge, skills and behaviours to "do the right thing at the right moment"".	Knowledge, skills and behaviors

Those definitions imply that competencies are context-specific, embedded in person, contain aspects of human capital like knowledge, skills, behavior or attitudes and connected to performance. In addition, they depend on the activities for which they are used, and on the environment. North and Kumta indicated with their "The Knowledge Ladder" that competence is more than knowledge, because it is only existing in connection with knowledge as foundation.

Employee Performance and how it is Defined

"Performance is not one thing" Campbell (2012) and consequently, many authors proposed its definitions based on which determinants they used to describe the construct "performance". Table 4 presents the selected definitions, which underlie different aspects of employee performance.

TABLE 4. Selected definitions of performance

Source	Definition of performance	Key Components
Murphy and Kroeker (1988)	"[...] set of behaviours that are relevant to the goals of the organization or the organizational unit in which a person works".	Behavior
Campbell (1999)	"[...] behavior or action that is relevant for the organization's goals and that can be scaled (measured) in terms of the level of proficiency (or contribution to goals) that is represented by a particular action or set of actions".	Behavior, action

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Table 4. Continue...

Source	Definition of performance	Key Components
Drucker and Maciariello (2008)	"[...] is rather the consistent ability to produce results over prolonged periods of time and in a variety of assignments".	Ability
Campbell and Wiernik (2015)	"[...] things that people actually do, actions they take, that contribute to the organization's goals".	Action

Among the theoretical models of job performance are models which explain the construct of job performance by deriving its dimensions, e.g., (Koopmans et al., 2011) and those identifying factors which explain variance in job performance (Schmidt & Hunter, 1998). Morever, there are models which see performance as dynamic (Murphy, 1989) and those seeing performance stable over time (Campbell, 2012).

(Murphy & Kroeker, 1988) used a construct-oriented approach to develop a general framework describing the dimensions of job performance for Navy ranks. First, they specified the set of goals. Second, based on those goals, the authors defined the set of nine dimensions. Third, they determined two categories of input variables: fluid and fixed. Fluid variables defined as changeable over time (e.g., experience) and fixed variables are relatively stable (e.g., cognitive ability). In the last step, they linked defined input variables which represent relevant attitudes of an employee at work to the specific dimensions of the performance construct. One year later, (Murphy, 1989) published his work on a dynamic performance model, where he differentiated between transition and maintenance stages. In the model he considered only two types of variables: abilities and dispositional variables. The results showed that cognitive ability is highly crucial during transition stage, e.g., when learning new techniques. During maintenance stage cognitive ability is less relevant, but rather dispositional factors such as motivation, etc.

Campbell worked with other scientists on their performance model over years. The revised model version specified the latent construct, job performance, in terms of eight factors. As per the model, individual performance variances are a function of direct and indirect determinants. To the direct determinants count current job-related knowledge and skills, choice to perform, level of effort commitment and the persistence. Indirect determinants are all variables which lead to individual differences in direct determinants (e.g., training). The indirect determinants are able to influence performance only by influencing direct determinants (Campbell, 2012). (Motowildo, Borman, & Schmit, 1997) assumed that performance is episodic, multidimensional and behavioral. They distinguished between task and contextual performance. Task performance is related to technical core of an organization and contextual performance to its social, psychological and organizational environment. In addition, the model incudes two basic tendencies, cognitive ability and personality. It implies that both cognitive ability and personality traits explain individual difference in task and contextual performance through intervening variables: knowledge, skills and habits.

Welbourne, Johnson, and Erez (1997) developed, based on role and identity theory, the Role-Based Performance Scale (RBPS) which included five different roles. The authors emphasized that the RPBS enables comparison between different jobs and organizations, because it focuses on multiples roles and it is generic and multidimensional.

Pulakos, Arad, Donovan, and Plamondon (2000) created in two steps a framework for determining the adaptive performance requirements of jobs. First, they used review and content analysis to identify dimensions of adaptive performance. Second, they used an instrument, the Job Adaptability Inventory (JAI) and applied exploratory and confirmatory factor analyses to test the eight dimensions of adaptive performance construct and to diagnose adaptive performance requirements for jobs. The result of their research showed that that different jobs require different types of adaptive performance.

Schmidt and Hunter (1998) analyzed relationship between General Mental Ability (GMA), job knowledge, job performance, and supervisor ratings for civilian and military jobs. Their findings are that GMA has the strongest effect on job knowledge acquisition and higher level of job knowledge in turn lead to a higher job performance. GMA influences also job performance directly, but those effect not as strong as those via job knowledge acquisition. This result is consistent with their previous work, where they concluded that GMA has strong indirect effect on job performance through job knowledge (Schmidt & Hunter, 1998).

Koopmans et al. (2011) conducted a systematic review of 35 existing frameworks of individual work performance and identified four performance dimensions which were used frequently in different frameworks. Table 5 summarizes the various dimensions of job performance which were conceptualized by the six previously described studies.

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TABLE 5. Dimensions of performance

Source	Dimensions of job performance	Number of dimensions
Motowildo et al. (1997)	Task performance, contextual performance.	2
Pulakos et al. (2000)	Handling emergencies or crisis situations, handling work stress, solving problems creatively, dealing with uncertain and unpredictable work situations, learning work tasks, technologies, and procedures, demonstrating interpersonal adaptability, demonstrating cultural adaptability, and demonstrating physically oriented adaptability.	8
Koopmans et al. (2011)	Task performance, contextual performance, counterproductive work behaviour and adaptive performance.	4
Welbourne et al. (1997)	Job holder role behavior, organization member role behavior, career role behavior, innovator role behavior and team member role behavior.	5
Campbell (2012)	Job-specific technical task proficiency, non-job-specific technical task proficiency, written and oral communication task proficiency, demonstrating effort, maintaining personal discipline, facilitating peer and team performance, supervision or leadership, and management or administration.	8
Murphy and Kroeker (1988)	Effectiveness in position, individual task performance, team task performance, interpersonal relations, job proficiency, job-related skills, task-related knowledge, down time behaviors, destructive / hazardous behaviors.	9

25 years ago, (Campbell, McCloy, Oppler, & Sager, 1993) placed a comment about the primitiveness of job performance theories. Since then, a number of researches have worked on theories and models of the job performance construct. The reviewed models of job performance conceptualized and operationalized different dimension to explain the job performance construct. As well as input variables which were involved to understand the variances are differ from model to model, which impacts sustainability of concepts consequently. Will those models deliver the same results when tested again with different data samples? This is the question. Despite many research approaches, no unified approach has been elaborated and no clear consensus about which dimensions explain job performance construct has been achieved.

METHODOLOGY

This research is exploratory and interpretative in nature. It is based on conclusions from the analysis of the existing theoretical literature and empirical studies conducted from 1962 to 2018 and related to the variables "in-company training", "knowledge", "competence" and "employee performance in the workplace". Essentially, it is not about the exhaustive recording of all investigations, but rather about their variables, methodology, results and research deficits.

This research work will provide an understanding of the available theoretical basis on in-company training, knowledge, competence and performance. It will summarize what has been empirically proven on training effects so far. This, in turn, will signalize a direction to understand effects of in-company training and the territory still to be explained, especially on employee's knowledge, competence and performance. The results will be used to develop a theoretical framework for future empirical research on the relationship between in-company training, knowledge, competence and performance of employees in the workplace.

EMPIRICAL STUDIES

The number of empirical publications on various training effects has been steadily increasing since the Human Capital Theory was shaped. The longest tradition is studies analyzing the impact of training on income, e. g. (Mincer, 1962). From 1990s, the number of studies analyzing the wage effects has taken a downswing. Instead, the studies analyzed the effects of training on employee and firm performance, productivity, fluctuation, behavior, knowledge, competence, attitude, etc. have appeared, e. g. (Kurtmollaiev, Pedersen, Fjuk, & Kvale, 2018). Also, geographically the picture has been changed. The first studies were conducted in US and West Europe, but within the last five years the number of studies from developing countries has been increased, e.g., (Suharno & Despinur, 2017). 65 empirical studies on training effects, thereof 45 from development countries, were analyzed. 52 of them used company data from databases or generated them from surveys and experiments. Another 10 of the analyzed studies used longitudinal data, in which respondents asked whether they participated in some form of training in a specific reference period and did not measure accumulated stock of training, e.g., (Loewenstein & Spletzer, 1999). Data sources of analyzed studies are summarized in Figure 1.

In 53 analyzed studies, training was defined as an independent variable. Depending on the study this denoted formal and informal training, on-the-job, off-the-job training, etc. However, the exact definition of training was not always provided, e. g. (Anitha & Kumar, 2016). 10 studies defined independent variable as competence, knowledge, skills or mix of training and development measures, e. g.

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(Kolibáčová, 2015). Performance, productivity and income were the frequently used dependent variables. Those 3 variables were used in 60% of all studies, e. g. (Marin-Diaz, Llinas-Audet, Chiaramonte-Cipolla, & Escardibul, 2014). The number of empirical studies on measuring the relationship between training and knowledge is relatively modest, 7 studies were identified, e. g. (Neirotti & Paolucci, 2013). Effects on competence, capabilities and skills were measured only in 5 investigations, e. g. (McLinden, Davis, & Sheriff, 1993). In reviewing the literature on relationship between competence and performance, 3 studies were found, e.g., (Mangkunegara & Waris, 2015). Figure 2 and Figure 3 demonstrate the utilized independent and dependent variables in analyzed empirical investigations.

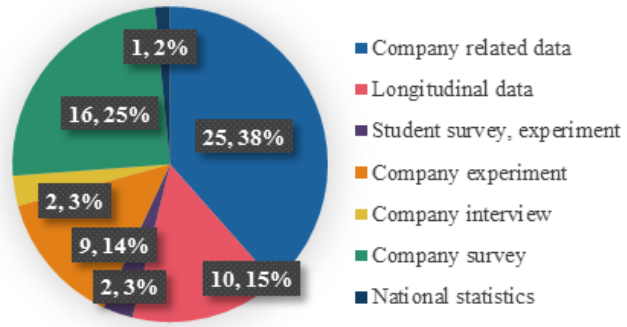

FIGURE 1. Used data sources in analyzed studies

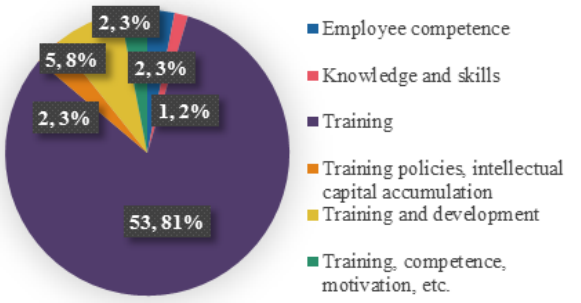

FIGURE 2. Used independent variables in analyzed studies

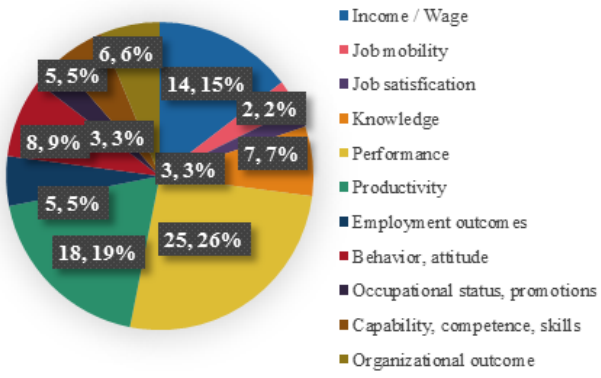

FIGURE 3. Used dependent variables in analyzed studies

Overall, the studies regarding training effects deliver contradictory results. There are analyses that proved a positive correlation between in-company training and wages and others that did not find a significant correlation, e. g. (Russell, Terborg, & Powers, 1985). The studies on the estimation of productivity effects of in-company training also provide a contradictory picture. Among them are studies that could not prove that general training has an impact on employee productivity, e. g. (Barrett & O'Connell, 2001). Besides the contradictory results, the research studies also cannot be easily compared, since the variable "training" was not always defined precisely and uniformly and was measured by the surveys differently, e.g., continuous training, training in the workplace, formal training, e. g. (Chien, 2013). Similar situation is regarding the examination of the relationship between training and knowledge. The study by (Rowell, Binkley, Thompson, Burris, & Alvarado, 2013) investigated an impact of food safety training on employee knowledge of food safety practices. The outcome is that managers did not obtain any additional knowledge after the provided food safety certification training. In contrast, the study by (Neirotti & Paolucci, 2013) and by (Schmidt & Hunter, 1998) showed the positive relationship between specific training and knowledge acquisition of employees. Similar is the situation with studies measuring relationship between competence and performance. A positive relationship between competence and performance was reported by (Mangkunegara & Waris, 2015) and (Kolibáčová, 2015). However, the recent research by (Suharno & Despinur, 2017) did not measure any effect. Another research by (Yang, Fang, & Huang, 2017) demonstrated a mediating role of competencies between training and task performance and proved a significant effect of professional, technical, and core competencies on the link between training and task performance. The results on the effects on dependent variables within empirical studies summarized in Figure 4.

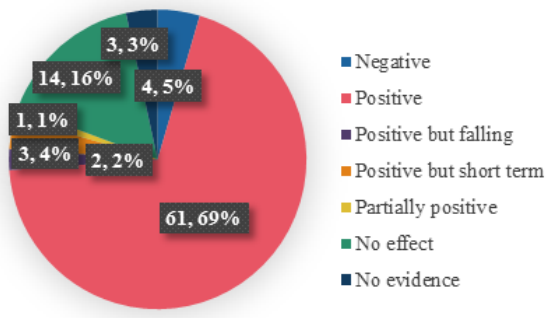

FIGURE 4. Investigated effects on independent variables in analyzed studies

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The review of empirical studies from different countries has shown that human capital and human capital analysis has been treated very differently by scientists. Various authors emphasize one or another aspect of human capital and its effects, considering their specific goals, methodology, challenges and contexts. The overview of 65 empirical studies with respective variables and effects is outlined in Appendix A.

CONCLUSION & IMPLICATIONS

The economic and management theories related to human capital, knowledge, competence and employee performance were reviewed. The investment in training was theorized within Human Capital Theory. It has not only theoretical, but also practical relevance for identifying the real value of training. However, the Human Capital Theory is behind the investment practice of companies and agendas of economic, social and political institutions on importance of lifelong learning. There is little empirical evidence available, often with contradictory results, on the question of the economic efficiency of the provision of in-company training. The statement from Mincer that "[...] "training" denotes investment in acquisition of skill or in improvement of worker productivity" (Mincer, 1962) is not always confirmed in empirical studies.

The theories on knowledge, competence and performance were developed after the Human Capital Theory. Nevertheless, they seem not to align on this theory or to continue to develop it further but rather to focus on independency. Although, some of the performance theories included training and knowledge as indicators in their models, but neglected competence or defined it by utilizing different terms.

Numerous empirical research studies have dealt with the explanation of training effects since the 60s of the mid 20th century. 65 empirical studies on various training effects were analyzed. The theoretical and methodological diversity of those empirical studies investigating relationships between training and other variables is very large indeed. The empirical investigations have measured the link between training and employee performance but not explored non-linear relationships and interdependencies between training and performance. There are a modest number of studies the depart from analyzing direct relationship and included mediating variables such as "competence". What we have today is a puzzle of theories and empirical studies on effects of training. No empirical study which examined the relationship between in-company training and performance of employees by using the mediating variables knowledge and competence could be found thus far.

"There is need for more work in measuring the return to training" (Acemoglu & Pischke, 1998; Mincer, 1962). "Empirical evidence on the economic impact of employer investment in training is only just emerging" (Asplund, 2004). "Our knowledge of training benefits is also limited" (Bassanini, Booth, Brunello, De Paola, & Leuven, 2005). The statements were made more than 10 years ago, because the most studies on training effects looked at the wage returns. Nevertheless, some of the scientists were aware of the limitations in their research and saw a lot of opportunities for further research. For example, Schultz concluded "But the state of the economic efficiency and that of the equity associated with the various forms of postschool investment are still among unknowns" (Schultz, 1972).

Before any conclusion regarding training effects on knowledge, competence and performance can be drawn, the following question for future research is proposed: "How does in-company training interact with knowledge, competence and performance"? or "What is the role of knowledge and competence in the relationship between in-company training and employee performance"? Another question from broader perspective could be: "How does general in-company training interact with three performance modes: individual, organizational and economical"?

"[...] what individuals have learned by age twenty-one will begin to become obsolete five to ten years later and will have to be replaced - or at least refurbished - by new learning, new skills, new knowledge" (Drucker, 1985). On the one hand, organizations follow the advice of Drucker and in-company training has taken an impressive upswing, on the other hand, the performance effects of in-company training and the role of mediating variables have only been partially explored in science. This is the driving force behind future research to investigate the effects of general in-company training on knowledge, competence and performance in the workplace. The resulting findings will have not only academic relevance but a significant practical relevance to design results-oriented learning strategies at companies.

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APPENDIX

TABLE 6. Analyzed empirical studies on training effects from 1962 till 2018

Authors	Independent Variable	Dependent Variable 1	Dependent Variable 2	Effect on Dependent Variable 1	Effect on Dependent Variable 2
Mincer (1962)	On-the-job training	Income	Employment behavior	No evidence	No evidence
Hand and Slocum (1972)	Managerial human relations training	Knowledge	Attitude, behavior	No effect	No effect
Holoviak (1982)	Company-sponsored training	Company productivity level		+	
Russell et al. (1985)	Retail sales training	Organizational support	Performance	No effect	+
Greenhalgh and Stewart (1987)	Vocational training	Occupational status of women	Occupational status of men	+	+
Bartel (1989)	Formal training	Labor	productivity		+
Schneider and Colan (1992)	Supervisor specific	training	Supervisor specific knowledge		+
McLinden et al. (1993)	Training	Competence in tax area		+	
Bartel (1995)	On-the-job training	Wage growth	Job performance	+	+
Black and Lynch (1996)	Formal off-the-job training	Productivity in production companies	Productivity in non-production companies	+	+
Barling, Weber, and Kelloway (1996)	Transformational leadership training	Attitudinal outcomes (e.g., charisma)	Financial outcomes	+	+
Dearden, Machin, Reed, and Wilkinson (1997)	Employer-provided training	Job mobility		-	
Krueger and Rouse (1998)	Training participation Turnover			No effect	
a. Barrett and O'Connell (2001)	General training Productivity growth			+	
b. Barrett and O'Connell (2001)	Specific training Productivity growth			No effect	
Dearden, Van Reenen, and Reed (2000)	Private sector training	Productivity			+
Zweimuller and Winter-Ebmer (2000)	Firm-specific training	Employee turnover			-
Der Vleuten (2000)	Training	Knowledge test			+
P. Jones (2001)	Firm-provided training	Productivity			+
De Kok (2002)	Firm-provided training	Production		No effect	
Cooney, Terziovski, and Samson (2002)	Training	Employee moral	Company effectiveness	+	+
a. Zwick (2002)	On-the-job training	Firm productivity		-	
b. Zwick (2002)	External training	Firm productivity		+	
Towler (2003)	Charismatic influence training	Declarative knowledge	Charismatic behaviors	+	+
Liu and Batt (2005)	On-the-job training	Employee	performance		+
Dearden, Reed, and Reenen (2005)	Training	Productivity		+	
Garcia (2005)	Training policies	Business	performance		+
Bell and Grushecky (2006)	Safety training	Effectiveness in reducing injuries		No effect	

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Table 6. Continue..

Authors	Independent Variable	Dependent Variable 1	Dependent Variable 2	Effect on Dependent Variable 1	Effect on Dependent Variable 2
Lowe et al. (2007)	Training	Knowledge	Attitude	+	+
Kuckulenz (2006)	Training	Wage	Productivity	+	+
B. Jones (2008)	Training	Job satisfication	Workplace performance	+	No evidence
Chauvin, Clostermann, and Hoc (2009)	Decision-making training	Capability	Performance	+	No effect
Konings and Vanormelingen (2010)	Firm training	Productivity	Wage	+	+
Hinerasky and Fahr (2011)	E-Learning training	Performance		No effect	
Pfeifer, Janssen, Yang, and Backes-Gellner (2011)	Employer-provided formal training	Employee suggestions	Promotions	Short term +	+
Khan, Khan, and Khan (2011)	Training and development	Organizational performance		+	
Magableh, Kharabsheh, and Al-Zubi (2011)	Training	Firm	performance		+
B. Jones (2008)	Training (general & firm-specific)	Wages	Organizational performance	+	No effect
Sultana, Irum, Ahmed, and Mehmood (2012)	Employer-provided	training	Employee performance		+
Sunardi, Widyarini, and Tjakraatmadja (2012)	Training	Employee behavior		+	
Birdi, Leach, and Magadley (2012)	Creativity training	Creative problem-solving skills	Motivation to innovate	Short term +	Short term +
Neirotti and Paolucci (2013)	Training	Acquisition of new knowledge	Organizational learning	+	No effect
Percival, Cozzarin, and Formaneck (2013)	Training Productivity		Partially +		
Fu, Yi, and Zhai (2013)	Training	Behavior	Sales	performance +	+
Chien (2013)	Intellectual capital accumulation	Organizational performance		+	
Rowell et al. (2013)	Food safety training	Knowledge of food safety practices		No effect	
Sung and Choi (2014)	Training and development	Organizational innovation		+	
Marin-Diaz et al. (2014)	Training	Financial turnover		+	
Dostie and Léger (2014)	Firm-sponsored training	Production	Wage	Falling +	Falling +
Kolibáčová (2015)	Employee competencies	Employee performance		+	
Huang (2015)	Business training	Financial performance		+	
Al-Mzary and Hani (2015)	Training	Employee performance		+	
Mangkunegara and Waris (2015)	Training, competence, etc.	Employee performance		+	
Odhong and Omolo (2015)	Training, skills development, etc.	Organizational performance		+	

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Table 6. Continue..

Authors	Independent Variable	Dependent Variable 1	Dependent Variable 2	Effect on Dependent Variable 1	Effect on Dependent Variable 2
Sembiring (2016)	Knowledge and skills	Firm performance		+	
Guerrazzi (2016)	Employer-sponsored training	Firm productivity		+	
Anitha and Kumar (2016)	Training	Employee productivity		+	
Groh (2016)	Soft skills training	Employment outcomes of young women		No effect	
Tetteh, Sheng, Yong, Narh, and Sackitey (2017)	Training and development	Employee performance		+	
Demiral (2017)	Training	Job satisfication and achievement		+	
Suharno and Despinur (2017)	Employee competence	Work performance		No effect	
Yang et al. (2017)	Training	Task performance		+	
Afroz (2018)	Training, motivation, etc.	Employee performance		+	
Sendawula, Kimuli, Bananuka, and Muganga (2018)	Training	Employee performance		+	
Kurtmollaiev et al. (2018)	Design thinking training	Sensing and seizing capabilities	Operational capabilities	+	-
Mensmann et al. (2018)	Personal initiative training	Female business success		+	
Sanyal and Hisam (2018)	Training and development	Employee performance		+	

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