ACADEMIA NACIONAL DE HISTORIA Y GEOGRAFÍA
1925-2025

DIRECCIÓN DE LITERATURA

LECTURAS DEL CENTENARIO
Número 89

ARGUMENTS IN FAVOUR OF TRAINING: THE RICHNESS OF TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (TVET)

VOLUME ONE

STEPHEN MURRAY KIERNAN

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THE RICHNESS OF TECHNICAL
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Lecturas del Centenario de la
Academia Nacional de
Historia y Geografía/UNAM

NÚMERO 89

Ciudad de México
Junio 2025

Author Biography

Stephen Murray Kiernan studied at the University of Dublin, the University of Cambridge, the Open University in the United Kingdom, and the University of Cape Town in South Africa. He is currently President of the Gandhi Mandela Foundation in Latin America and Director of the "Leaders of Global Impact" project of the Marcelino Muñoz Foundation. He is also Grand Master of the Most Illustrious Order of Saint Patrick, dedicated to friendship between Ireland and Latin America.

He served as president of the Postgraduate Council of the Universidad Anáhuac in Mexico City, director of the Alliant University (formerly the United States International University) and of the Centre for International Business Education and Research (CIBER) at the World Trade Center in Mexico City; president of the International Parliament of Education Foundation; and director of the Mexican-Japanese Lyceum. He was also a senior consultant on university affairs for the World Bank Group, during which he established the African University of Science and Technology and drafted policies on technical and vocational education and training (TVET) for 95 developing countries, among other achievements. He also participated in projects for the World Bank to develop the oil industries of Nigeria and India, and the world's largest mine, located in Indonesia.

He was editor of an academic journal for Oxford University and a journalist specialising in international affairs for El Economista. He has been an extraordinary professor of Anglo-Irish literature at both the National Autonomous University of Mexico (UNAM) and the Foundation for Mexican Letters. He is a member of Mexico's National Legion of Honour and the National Academy of History and Geography (UNAM).

He is the author of fourteen books whose topics range from the history of theatre in Great Britain to the contemporary importance of technical education in the development of poor countries. He has also published more than 300 articles in newspapers and magazines and edited The Anáhuac Journal for Oxford University. He has organized 220 cultural events over the past 15 years. His email is smurrayk@cilatam.com and his website is www.cilatam.com.

Arguments in Favour of Training: The Richness of Technical and Vocational Education and Training (TVET)

Index

Summary

This study endeavours to address the issue of technical and vocational education and training (abbreviated to TVET) as a key element in social, working and entrepreneurial advances in the contemporary developing world.

The first part attempts to achieve a bibliometric analysis of research into TVET, with a focus on keywords, then on country and institute location of publications, and lastly a contrast between examples of common research topics and less common ones. In the following section the highly practical question is posed: whether in-company capacity building or training is really essential for the growth and flexibility of the firm located in a developing country.

In the third part of the study, the topic is addressed concerning training both within a company and between companies, leading to a successful situation of what could be termed a “training spillover”. The following section continues this theme by focusing on the question whether a genuinely successful training system can be created between companies which are located close to each other.

The fifth part evaluates the possibility that training knowledge, whether in tacit or codified form, succeeds in implementing a working training situation both within a particular company and among two or more of them. Section six gives an overview of what has been argued in previous parts and endeavours to encourage more support for this area of education and personal development.

General Introduction

The rationale for this study argues that "classical" literature on the subject of technical and vocational education and training (TVET) - by authors such as Middleton *et al.* (1991), Bennell (1999), Johanson (2001), Grierson (2002), Ziderman (2002), Johanson and Adams (2004), Haan (2006), Asian Development Bank (2009), Pilz (2017), Guile *et al.* (2019), and ILO (2019) - does not adequately address the issue in terms of the skills within the company (intrafirm) and between companies (interfirm), and knowledge of the training.

This present investigation was carried out as a result of the clear recognition of two factors: one with a strong presence and another with an obvious absence. In the developing world today there is a deep recognition that the provision of training can be improved if it is developed along with business needs. There is also a growing number of companies, of many types and sizes, that enter more directly into the field of training, either as clients of public or private training institutions, or as hosts of their own internal competence development. At the same time, an absence was clearly identified: a gap in research on business training or at least the gathering of pertinent comments and experiences that have occurred recently.

This study was undertaken using the following methods:

1. A careful bibliographic revision was carried out of the most pertinent literature on the topic of technical and vocational education and training (TVET) – with a focus on single firms or groups of firms – employed as a means of raising developing countries from a position of deep poverty, lack of skills, under-utilised natural resources, stunted growth within and among companies, and civic disorder. To analyse this research field, raw data was collected for all the published documents on TVET using bibliographic sources such as Scopus.

2. Maintaining this focus, a series of visits were made to institutes and companies participating in TVET, in order to identify their best practices through one-to-one interviews, questionnaires, observation of activities and achievements, and collection and interpretation of results. The field investigation lasted two years. A questionnaire was designed and sent to 65 training directors, workers, entrepreneurs and experts in social development. Their comments have been a tremendous help in raising awareness of what can sometimes be arid generalizations regarding something that is of great importance to the development of skills, employment and general well-being of many people in the developing world. Some respondents, such as Bas van den Brink of the Dutch CBI Institute, Peter Mosel in Indonesia, and Rolando Toledo and Ashok Shah in India, made special efforts to help, spending a lot of time on conversations on the subject. The author was able to visit the projects that are discussed in different places in the text as well as in the cases. Work also meant reading a large number of documents concerning these same projects. The visits, interviews and other investigations that were carried out made him even more aware of the absence mentioned in the first paragraph of the introduction.

3. An attempt was also made to interpret enterprise-based TVET using theories and explanations applied successfully in other fields, as a means to achieve an original understanding using transferable and reliable methods of how TVET works, and why and where it is appropriate.

4. State-of-the-art bibliometric tools were used in order to provide statistical analysis of the quantitative data provided by the scientific literature, in this way supporting some of the methods and conclusions reached in sections 1 and 3 in this description of methodology. Thus, data was thoroughly analysed, data that included annual distribution of key words, the main research institutions and cooperation between them, keyword matching, and distribution by topic and country (Rongyin and Limin (2010), Cobo *et al.* (2011)).

5. This activity centred on keyword analysis that permitted a clearer understanding of the development of disciplines or topics within the general theme. However, as many key words and concepts found in this study are, as far as is known, original elements in this assessment and interpretation of TVET, the bibliometric method was limited but still very useful.

6. In order to attain methodological rigour and credibility, special attention was made on overall study design, outcomes evaluation, regional comparisons, analysis of the effects of individual intervention components, clarity of definitions, sample reliability involving such matters as size and other deviations, identification of investment (financial or otherwise) by firm or firms in TVET activities, presentation of concrete outcomes (skills improvement, employability, etc.), measurement of change of attitudes and prestige of TVET. Further emphasis was placed on evaluation of such pivotal but overlooked preoccupations as tacit and codified training, social and institutional cooperation, training spillovers, reduction of bias incurred by use of inappropriate though credible techniques, macroeconomic benefits such as net employment outcomes, and replicability of the study itself.

The author considers the issue to be very important due to the following reasons: the growing leadership of certain companies in the proper and well-managed development of training and education, the innovative role of the company and institutional groupings in financing (with possible government assistance), as well as the indirect effects of the provision of professional skills and related support. Literature has not yet fully investigated these developments.

The author also believes that certain recent thoughts on the learning enterprise, innovation systems and value chain theory, as found in the literature (Davila *et al.* (2006), Sheffi (2012), Powell and McGrath (2014), etc.) could be adapted to better explain the recent and very large measures taken by companies in the field of training, as well as the internal and external (to the company) consequences of training programs and standards related to

business. In addition, it is argued that a new theory can be created that addresses the reality of professional and technical training, and its part in the empowerment and creation of knowledge and innovation, in the developing world.

This study is divided into five sections. The first of these speaks of the bibliometric analysis of research into technical and vocational education and training (TVET). The following sections address the need for training within the company; the company's role in the provision of training; the measurement of training (its success, etc.) and returns to training; the complementarity between training and the organization and the operational practices of the company, and the benefit of this; the question whether training leads to decentralization, staff reduction and more specialization; the costs incurred in training and the effect of training in terms of salary level; the difference between an upstream and downstream training system; the relationship between new innovations and training; the relationship between training and its appropriateness in the context of company needs; the possible evolution of the training system after its initial establishment, and in the end the effect of the increase in training on employment and interfirm cooperation.

Key words or phrases: TVET, Technical and Vocational Education and Training, In-company Training, Returns on Training, Training Costs, Evolution of the Training System, Training Needs, Training Providers, Skills Spillovers, Tacit and Codified Knowledge, Developing Countries and Training.

Section 1

Title

A Bibliometric Analysis of Research into Technical and Vocational Education and Training (TVET) with a focus on keywords, country and institute location of publications, and a contrast between examples of common research topics and less common ones.

Summary

This section analyses a number of issues associated with Technical and Vocational Education and Training (TVET) using contemporary bibliometric methods. It is divided into two parts. The first deals with keyword frequencies in TVET in refereed publications and, on this basis, in which countries and institutes TVET research is most common. The second part makes a contrast between some of the most common focuses of these research projects and other themes that have attracted less attention. Through these means, the author makes a point that there is still a lot of work to do on the realities and potentialities of TVET and research into it.

Key words and phrases

Technical Training, Vocational Education, TVET, Technical and Vocational Education and Training, Bibliometric Analysis, Countries, Institutions, Authors, Developing Countries and Training, Returns on Training, Labour Division, Complementarity, Appropriability.

Introduction

The rationale for this study argues that "classical" literature on the subject of technical and vocational education and training (TVET) – by authors such as

Middleton *et al.* (1991), Bennell (1999), Johanson (2001), Grierson (2002), Ziderman (2002), Johanson and Adams (2004), Haan (2006), Asian Development Bank (2009), Pilz (2017), Guile *et al*. (2019), and ILO (2019) – does not adequately address the issue in terms of the skills within the company (intrafirm) and between companies (interfirm), and knowledge of the training.

The following investigation was carried out as a result of the clear recognition of two factors. In the developing world today there is a deep recognition that the provision of training can be improved if it is developed along with business needs. There is also a growing number of companies, of many types and sizes, that enter more directly into the field of training, either as clients of public or private training institutions, or as hosts of their own internal competence development. At the same time, an absence was clearly identified: a gap in research on firm-level training or at least the gathering of pertinent comments and advances that have occurred recently.

An analysis was undertaken of raw data relating to published documents on TVET using bibliographic sources such as Scopus. The bibliometric tool was used in order to provide statistical analysis of the quantitative data provided by the scientific literature, in this way supporting some of the methods and conclusions reached. Thus, data was thoroughly analysed, data that included annual distribution of key words, the main research institutions and cooperation between them, keyword matching, and distribution by topic and country (Rongyin and Limin (2010), Cobo *et al*. (2011)).

Training and skills are a part of the knowledge pool; framing and interlinking them is organisational knowledge. Effectively this comprises a means and a structure so that whatever abilities are created through skills development activities are then put into use and produce some sort of benefit (Dosi *et al*. (2000), Leahy (2012). The resulting capabilities and competencies become part of the problem-solving, production-enhancing

and strategy-adjusting resources of the particular firm. On the same theme, this also means that ideally a balance should be reached between the actual capabilities/competencies and hoped-for performance goals of the firm and those responsible for skills production. Otherwise, there is no full exploration of the talent produced or, vice versa, the training is inadequate to real needs.

The author considers the issue to be very important due to the following reasons: the growing leadership of certain companies in the proper and well-managed development of training and education, the innovative role of the company and institutional groupings in financing (with possible government assistance), as well as the indirect effects of the provision of professional skills and related support. Literature has not yet fully investigated these developments.

In terms of methodology: to analyse this research field, raw data was collected for all the published documents on TVET using the bibliographic sources available in Scopus. This activity centred on keyword analysis that permitted a clearer understanding of the development of disciplines or topics within the general theme.

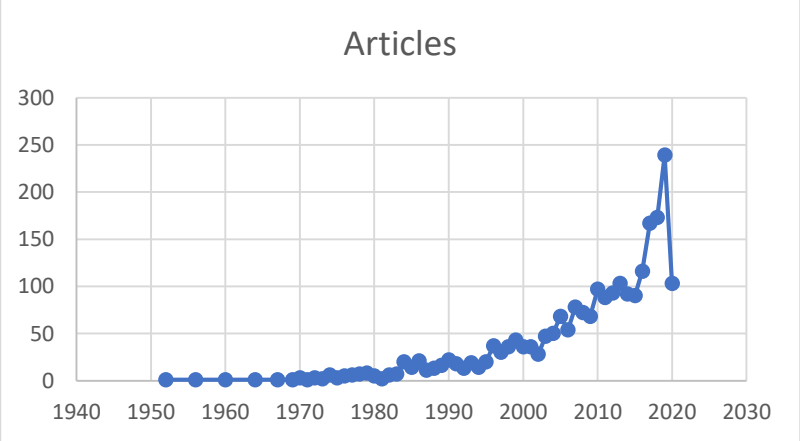
Results and Discussion

Part 1: Analysis of Keywords in TVET Research using Bibliometric Methods, and Country and Institute Locations

The author made a bibliometric investigation of scientific databases, which involves the analysis of previous investigations through a process of identification, grouping and consultation of elements in the literature that are useful for the purposes of studying the main themes of this work. Applying this bibliometric methodology, we identified in the Scopus scientific database 2,315 articles, which coincided with our criteria.

According to the results, there is a lot of literature on several key topics in this field of research: technical and vocational education and training (TVET) (259 articles), provision of training (505), training in the company and between companies (77), the return through training (33), its costs (1,320), compensation for "graduates" of training (21), innovation and training (90), and of course specialized training in specific sectors (mines, oil industry, etc.). These numbers show very clearly that there is a very strong interest in TVET due to its role in the economic development and industrialization of countries. In the area of academic research, there was a very revealing growth in terms of research publications related to technical and vocational training, especially during the last five years, and the trend seems to show that it will continue to grow in the coming years (Fig. 1.1).

Fig. 1.1. Annual scientific production: Annual growth rate of the term TVET – 15.41%



However, we discovered that there is very little research on many important topics in this study: training needs within business firms, complementarity between business formation and organization, the relationship between training/division of labour/specialisation, training system upstream vs. downstream, appropriability of training at the firm level, training system between companies, spillover of and returns on training, and

knowledge of tacit and coded training, among others (Table 1.1 and Fig. 1.2). This article will address these shortcomings in its latter paragraphs.

Table 1.1. Most frequent words

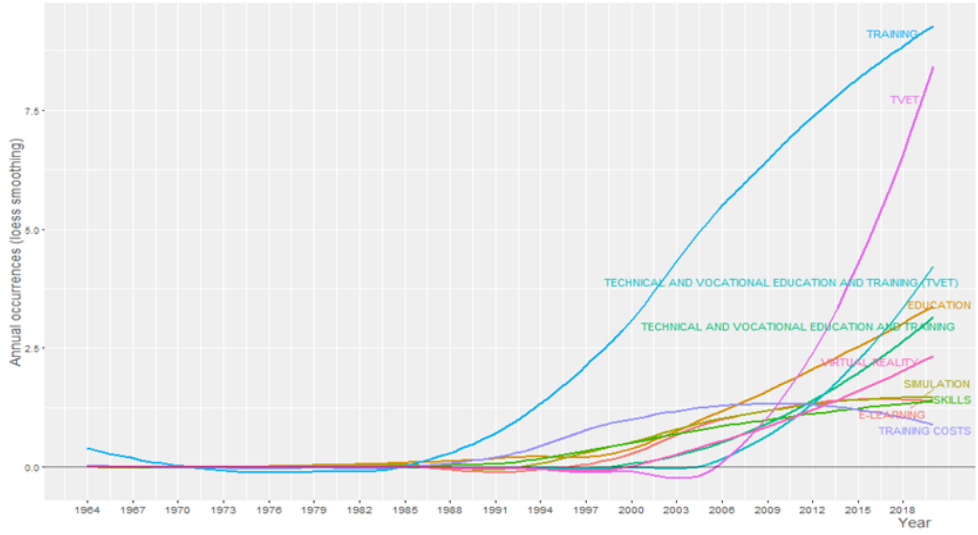
Words	Occurrences
Training	158
TVET	45
Education	42
Training costs	31
Simulation	27
Technical and vocational education and training	26
E-learning	25
Technical and vocational education and training (TVET)	25
Skills	24
Virtual reality	22
Innovation	21
Deep learning	19
Human capital	19
Vocational training	19
Machine learning	16
Vocational education	16
Cost-effectiveness	14
Productivity	14
Cost	13
Blended learning	12

We can also see which are the most popular words in the scientific databases related to this topic of TVET, among which the following stand out for being directly connected to training and new communication

and information technologies: training (158), TVET (45), education (42), e-learning (25) and virtual reality (22) (Table 1.1).

We can also show the evolution over time of the frequency of words and phrases connected to TVET, in order to show their milestones and in what years they occurred (Figure 2). This information is based on articles published in refereed journals, and brings us closer to following the evolutionary line of words and phrases and their growth or decrease in a simple way, and also to understand their behaviour regarding the importance of this topic in different countries.

Fig 1.2. Word dynamics



The works specifically on TVET published in peer-reviewed journals are mainly from the United States of America, the United Kingdom, and China, with between 120 and 280 articles published on this topic in each of these countries (Figures 3 and 4). Europe in general and Australia are very well represented: for example, in Germany there is a lot of research in this field perhaps for its highly developed culture of apprenticeship, while in the case of Australia it could be due to the importance of natural resources in its national economy. Many publications in developing countries have also been produced, assuredly because of their evaluations of necessary educational options and skills in terms of their own socio-economic growth (Malaysia,

South Africa, Brazil, India and Iran).

Fig. 1.3. Country of the corresponding author

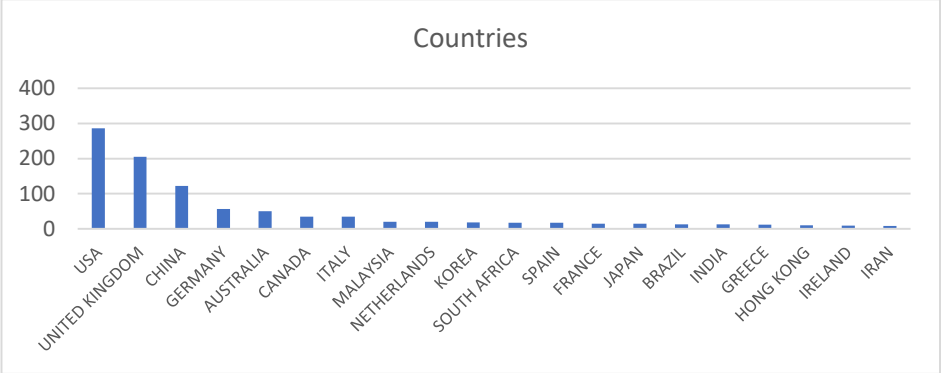


Fig. 1.4. Production of documents on TVET – Country

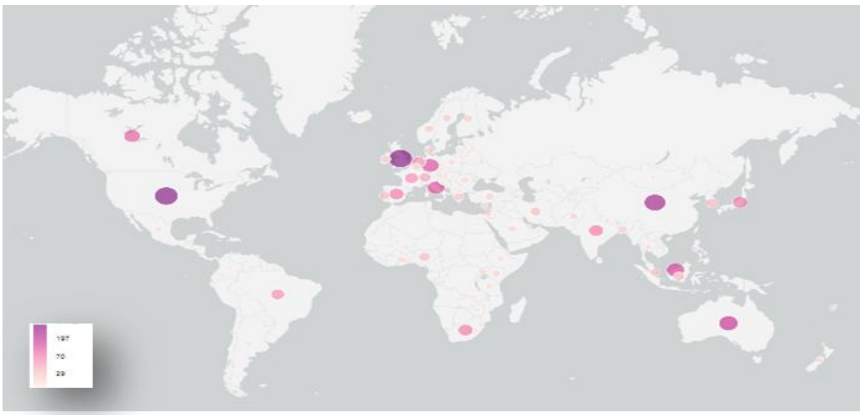
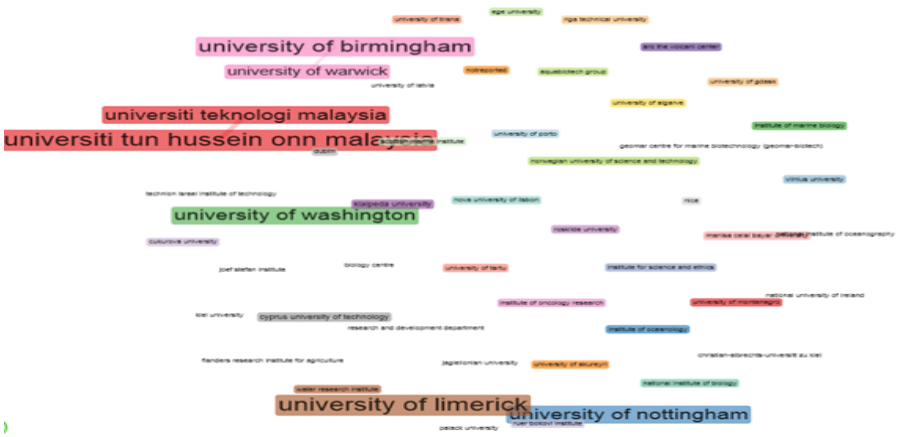


Fig. 1.5. Network of collaborating institutes



According to our research, there are some institutes of higher education where research on the subject does have a relatively strong importance; in addition, the connections that are identified in Figure 5 allow us to see the collaborations that the institutions have: among the more active institutions are the Universiti Teknologi and Universiti Tun Hussein Onn in Malaysia, and the universities of Limerick (Ireland), Nottingham, Warwick and Birmingham (United Kingdom), and the University of Washington (USA). If an institute focuses on technical education or something similar, the explanation is obvious. In these cases, it generally has something to do with the support of the national government (which might give targeted financing or other encouragement in the context of a national development plan), general interest in practical issues involving local industrialization, demand for graduates with this ability, and occasionally a response to identified needs of firms seeking improvements in their own technical performance – there are many reasons and none is exclusory.

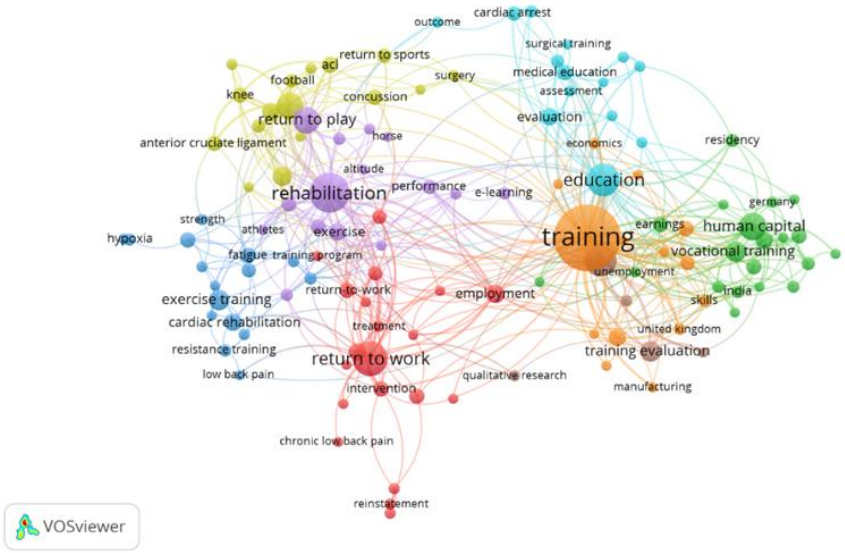
Part 2: Bibliometric Analysis of Returns on Training and its Complementarity and Appropriability

In this section we would like to address a number of concrete subjects according to bibliometric analysis: the first focuses are on consequences of investing and providing training, the latter focuses are to do specifically with the complementarity and appropriability of training. The first themes are discussed in a great many publications, the second appear in far fewer studies.

The topic of returns on investment in training is one of the most important in the context of various considerations: of course, it stands as such in terms of the question of the existence of TVET *per se*, as well as other factors such as its sophistication, modality, duration, and benefits for all participants, among many issues. The number of documents on this key topic

– 10,888 – clearly shows the role it plays in TVET's analysis and development in real terms (fig. 1.6).

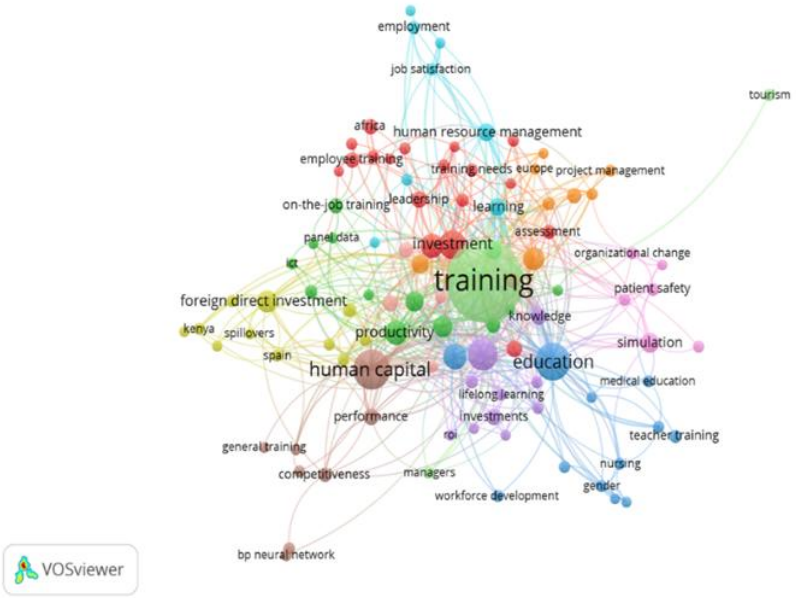
Fig. 1.6. Return on Training: 10,888 document results



The topic is linked to various fields in the literature: employment and unemployment, human capital, vocational training and income, education and evaluation/counselling, and return to work.

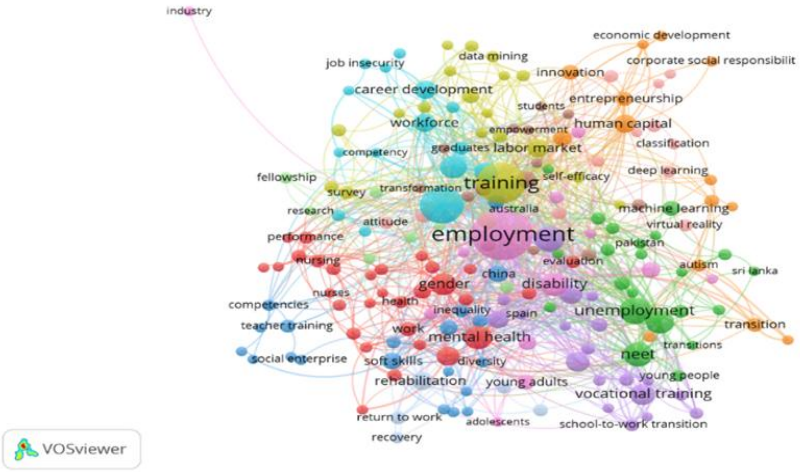
Equally, the relationship between investment and training is a very important research topic and has led to a huge number of publications: our analysis yielded 10,853 results. The general theme is related to a range of fundamental topics related to the well-being and development of TVET. The most important are investment (linked to leadership, training needs and human resource management), foreign direct investment and indirect effects, human capital (competitiveness and performance), and other fields such as project management, lifelong learning and organizational change.

Fig. 1.7. Investment and Training: 10,853 documents



The issue of training and employment involves a large multiplicity of questions and thus led to a huge number of results in our bibliometric analysis: our search led to in 19,485 results (fig. 1.8). This double topic in the literature has been investigated in conjunction with gender and diversity, unemployment, human capital and entrepreneurship, the labour market as well as professional development and the graduate labour market, in addition to job insecurity, social development and the transition from school to job.

Fig. 1.8. Training and employment: results of 19,485 documents



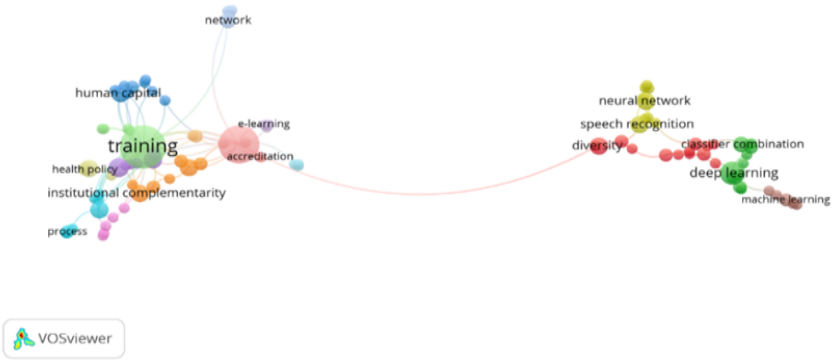
These issues of returns on increased investment and training, leading to an increase in employment levels, lead to the following conclusions:

1. If the skilled worker is simplistically thought of as the more productive type of employee over his unskilled alternative, and if whatever extra costs associated with him do not eliminate this cost/productivity advantage, then the skilled worker should be preferred under these conditions and in view of the support he will give to future firm-wide developments. Thus, training should reduce job precariousness and indeed should help in promotion.
2. If a training system is immature or not present (and there is a time issue) then the firm might prefer to employ skilled workers even from a great distance to create the necessary skills pool immediately. On the other hand, should a training system be in place, either internally or locally, then the unskilled/semi-skilled might be taken on in comparatively larger numbers than otherwise and developed according to the skills gaps and projections of the firm.
3. Again, according to the same model of a functioning training system, the perception of success in training outputs might lead to an expansion of job offers to similarly unskilled/semi-skilled candidates. The contrary could occur, needless to say, and the firm decides to develop other options to replace a skills development experiment that, for whatever reason, didn't work. This absence will mean that, if the local pool is in general unskilled, then this will affect their ability to enter the firm or, once contracted, their ability to rise through a process of upskilling (Hogrefe and Wrona, 2015).
4. There are other possible scenarios. One common one consists in the firm hiring the more senior people from outside (e.g.,

multinationals with a pool of easily transferable employees), at least in the early stages though often this is long-term, and concentrating their capacity-building efforts on local entrants who operate in relatively simple, lowly paid but essential positions such as truck-drivers, electricians, bricklayers, miners, and so on. While there might exist non-business reasons (community relations and licensing commitments, etc.) for undertaking this, it makes perfect business sense to take on underdeveloped locals if their educational level does not make them training-recalcitrant, if an existing viable alternative is not to hand, and if the work the trainees will do is not particularly fundamental to operations and needed urgently.

We can now pass on to a number of relatively underdeveloped themes in the field of research on TVET. The question of training complementarity is a relatively recent issue, confirmed by the comparatively low number (472) of documents identified in our bibliometric analysis. According to this activity, the most important topics are institutional complementarity, human capital, accreditation and virtual learning. Other issues – process, networks, diversity, classifying combination – appear in a few publications.

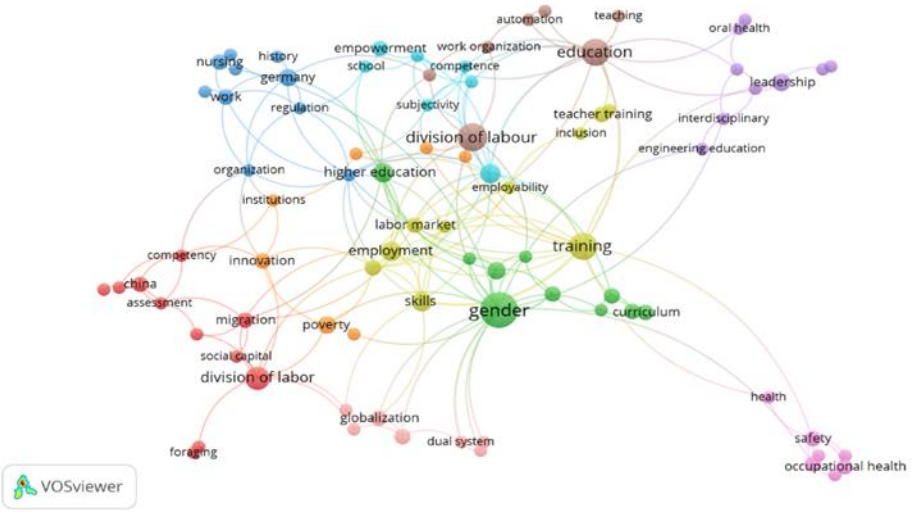
Fig. 1.9. Complementarity of training: 472 results of documents



There appears to be a complementarity between the organisational structures, procedures and routines of firms and the training that fits, supports and indeed extends them. The question then is, is there a clear organisational culture or set of employment practices that dictate what training should be done, by whom, for whom and when? This involves identifying which are the internal determinants of the training regime. The skills development undertaken will thus be contextualized and credible through its recognized derivative relationship with the business objectives as well as the work practices operating in the firm itself.

The topic of the division of labour in the context of training, although again it is not so common in the publications that were identified (477), is related to a great diversity of issues. Regarding training and the division of labour, authors have written on teaching, organizational work, and automation; leadership; empowerment, competence and subjectivity; labour market, employment and skills; organization and regulation; gender and curriculum; labour division in terms of social capital, advice and migration; institutions, innovation and poverty; globalization and the dual system; occupational health and safety.

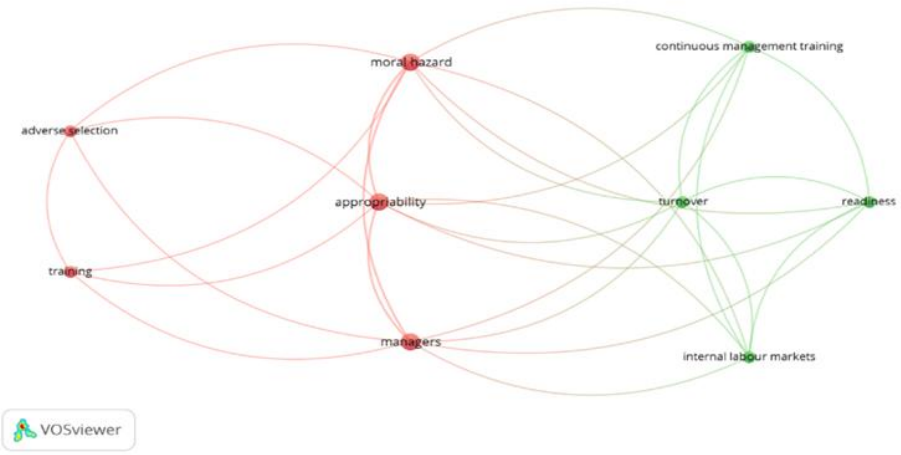
Fig. 1.10. Training and labour division: results of 477 documents



The results of a relative increase in supply of skills is that workers become capable of performing a wider range of jobs in a gradually more autonomous way, leading to the decentralisation of task assignments and reduced division of labour (Mookherjee *et al*. (2010) and Milner *et al*. (2013)). This is certainly the case in many developed countries, but perhaps not so common or inevitable in the context of a developing country, unless (arguably) additional procedures are added to the training to emphasise autonomy of work and multi-tasking, and to counter ingrained behavioural and mental processes. As such, these additions must address such pro-business routines as worker interactions (Calvó-Armengol and Martí Beltran, 2009), decentralised as opposed to hierarchical working practices, the capability to learn competently by *doing* and not just by *studying* practices (Tapsoba *et al*., 2019), and the elevation of workers as active decision-makers (Elms *et al*., 2010).

There is a paucity of publications on the subject of training appropriability. According to our bibliometric analysis, research activity has been quite restricted: the main ones are appropriability linked to moral hazard, adverse selection and manager training, and staff turnover linked to internal labour markets, training and preparation for continuous management.

Fig. 1.11. Suitability of training: results of 4 documents



This less-researched topic deserves some comment. Training in itself is not characterised by such restrictions on appropriability as secrecy, patents, continuous ground-breaking innovation and the dominance of complementary assets, as described in similar contexts by Su *et al*. (2013); rather it is eminently discoverable, available, transferable, adaptable and updatable. No matter what the general firm capabilities and on-site circumstances might be, ideally there should exist a level, content variety and amenable source of the required skills development. If done well and conditions are favourable, skills formation can be built up in stages, leading to increasing returns if carried out continuously and adapted to specific firm-level demands (Hage *et al*. (2013), Anadon *et al*. (2016)).

We can look at this further at the level of the firm, sectoral and non-sectoral cluster. If the training system within the firm is well-developed but focused towards in-house needs and practices, then it might have a high level of appropriability, particularly if its accumulated constituent components are not diffused; at the same time, some amount of diffusion might have advantages especially if competitive implications are not strong. At the broader interfirm and sectoral levels, if the shared training is extensive and well-endowed, then this indicates that widespread externalities exist: that interactive and diffusion activities – perhaps within selective limits based on competitive fears (Groenewegen y van der Steen, 2006) – would appear to be normal practice. Finally, looking beyond sectoral limits but still at the local level, the existence of a well-developed skills formation regime suggests that diverse local firms and institutions have separately and in partnership accumulated training capabilities in a network of localized training externalities.

Conclusion

The author believes that the process of bibliometric analysis is a dependable and indeed compelling tool to be used in TVET research. Through it, it is

shown that in terms of annual scientific production, TVET research has recently reached a healthy level of activity. Interestingly, while obvious keywords are dominant in the literature (education, training, TVET), other keywords related to contemporary methods and equipment have recently become increasingly significant (e-learning, information technology). On the other hand, the same tool also reveals that certain areas are demonstrably lacking in concerted efforts at research.

Four countries are the homes of the most authors on this subject (the United States, the United Kingdom, China and Germany), but importantly a number of less-developed nations have a strong presence in published TVET research, an indication of concrete local demand for this knowledge. Our research even showed that two institutes in Malaysia have achieved a strong investigative culture in matters relating to TVET, easily the equal of any other institute at the global level.

The paper presented clear evidence that certain topics – the examples were return on training, investment in training, and training and employment – are associated with a large number of publications. And this was contrasted with the small investigative investment made in other areas, the examples being training in the context of complementarity, appropriability and division of labour.

The author contends that certain sub-fields of TVET activity will offer a rich mine of material and insight. Equally, he argues that certain recent thoughts on such matters as the learning enterprise, innovation systems, and value chain theory, as found in the literature (Davila *et al*. (2006), Sheffi (2012a, 2012b), Powell, and McGrath (2014), etc.), could be adapted to better explain the recent and very large measures taken by companies and institutes in the field of training, as well as the internal and external consequences of training programs and standards related to business operations and performance, and even government-sponsored development projects.

In short, it is obvious that a more panoramic understanding of TVET

in theory and practice should be created that addresses the reality of vocational and technical training, and its part in enabling and creating knowledge and innovation, particularly in the developing world.

Section 2

Title

In-company capacity building or training: Is it essential for the growth and flexibility of the firm located in a developing country?

Summary

The article speaks about the need for training within the company; the company's role in the provision of training; the measurement of training (its success, etc.); what its role is in training provision; and what might be the evolution of its training commitment after its provision has been established.

Key words and phrases

Training, Education, Technical Training, Vocational Education, TVET, Technical and Vocational Education and Training, In-company Training, Training Needs Analysis, Training Cluster, Multinational Companies, Training Providers, Skills Spillovers, Tacit Knowledge, Codified Knowledge, Developing Countries.

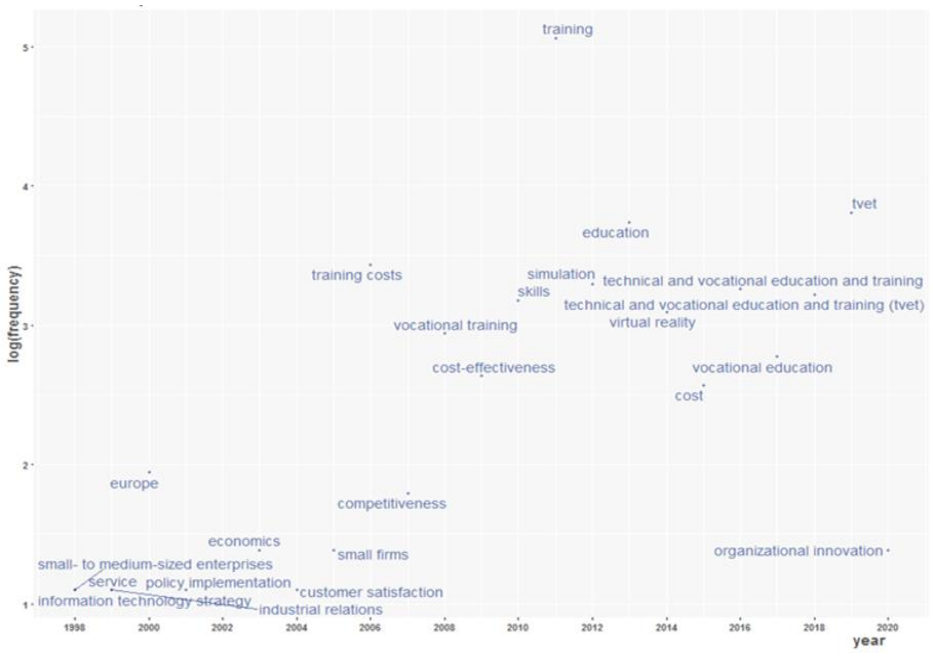
Introduction

Training might involve either an in-company accumulation of content, structure and techniques gradually increasing (and perhaps becoming more specialised) as advances are made; or a coming-together (haphazardly or consciously) of different training components originating and exploited by different agents in different fields, both within a particular sector as well as outside it. The essential element here may be the existence of a reliable system or network – inside the firm (intrafirm) or between firms and other agents (interfirm, cluster, etc.) – of interaction and communication through which necessary dispersal and access to training knowledge may occur

(Delvenne y Thoreau, 2012). In short, there can be a functioning complementarity at the firm-level between internal and external inputs relating to human capital formation. The key points here are accessibility to these inputs, competence to use them, and opportunity to implement them in the workplace. This requires internal learning and analysis, creation or strengthening of internal capacities, and discovery of external tacit and codified knowledge and provision, that are a good fit and available at prices that the firm can pay (Gardingen y Karp (2006), Richter *et al*. (2018)).

According to the literature in peer-reviewed publications contained within scientific databases, the importance of TVET is recognised, in terms of the well-being and growth of companies. It already has a long history, from its role in SMEs to its profitability and the part it plays in organisational competitiveness and innovation. In Figure 2.1 we can see which themes are the most recognised and the importance that they have had in a specific period.

Fig. 2.1. Trending topics in TVET



As a response to the changing environment, there may come into play timely and appropriate adaptation, integration and reconfiguration of internal

and external skills, resources and functional competences. This relates to the dynamic capabilities approach developed by such authors as Schumpeter (1934), Penrose (1959/1995), Nelson and Winter (1982), Teece *et al*. (1994), and Celo and Chacar (2015). Timely responsiveness depends on the need for service or product innovation, management coordination capability, ability to take advantage of internal and external competences, skills and knowledge level of participants, financing, facilities and technology.

When the issue of training capability is being addressed, there are two very integrated but entirely different issues at stake. The first involves the capability of the company or the external provider to develop skills and knowledge; the second involves the capability of the trainee to be developed. In the same way that the importation of new technology does not in itself mean that a firm will become technologically advanced just by installing it (Djankov and Saliola, 2019), so the installation of a full capacity-building apparatus does not necessarily have to translate into impeccable outputs in the form of skilled workers later on.

There will inevitably be differences concerning the criteria of training value according as the emphasis is on production expansion, human resource consolidation, profit increase, dynamic increasing returns and adoptability (sourced from learning by doing and the appearance of complementary activities and norms (Teubner, 2017)), and the wider implications related to locality, community, sector, general industry and society at the national level. This is further complicated by questions concerning how performance data are generated and analysed; and its very empirical reliability and appropriateness of interpretation, especially in the near or complete absence of objective criteria for measurement purposes, a lack of specification and feedback, and so on (Nelson *et al*. (2004), Lundvall (2016).

It is important not to confuse scenarios that belong to a “developed” or industrialised setting, with the quite different set of circumstances pertaining to a remotely located and undeveloped setting. The conditions

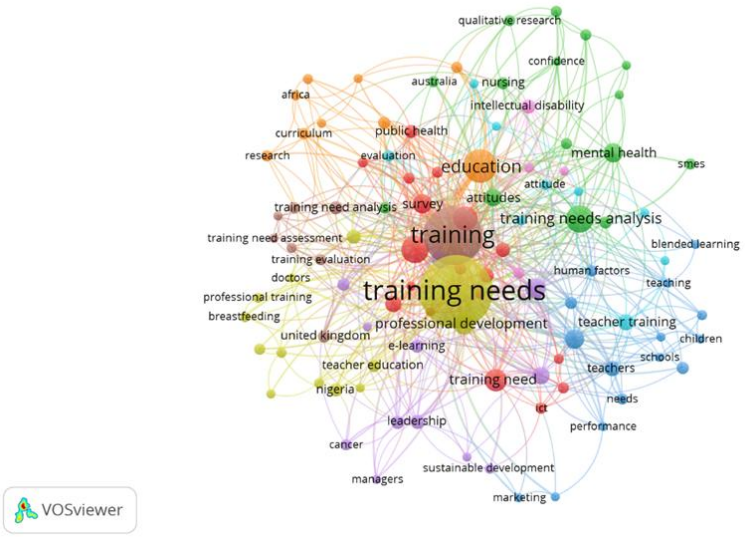
underpinning economic and knowledge principles are very different. There are differences in terms of timescales, educational base and skills development effort, physical and logistical challenges, support structures, skills pool, employment options, and so on, that should not be ignored.

Results and Discussion

1. Why does a firm choose to train its work force?

A company may find itself in a situation in which, due to some minor need or perhaps for reasons of survival, it has to obtain, create or develop a training service. In the following, we analyse the scientific articles on different topics regarding TVET from the Web of Science database with the VOSviewer software.

Fig. 2.2. Training needs – 6,721 document results



We finish with the following conclusions as the result of a bibliometric analysis:

(i) The issue of training needs is a very widely researched topic: we found 6,721 documents.

(ii) There is a great diversity of elements associated with this main theme: analysis of these needs (from attitude, trust and mental health to qualitative research), trainers (from their own training to human factors, children, schools, performance and mixed learning, etc.), and then its link with assessment / advising, curriculum, professional development, leadership and sustainable development.

Skills development can be important in terms of competitive advantage if the firm carries it out in a way that keeps costs low and puts appropriate skills to best productive use in an accommodating organisational environment, relative to competitor firms. Some of the competitive advantage of a firm, after all, may well lie in its capacity to nurture and use its skills resources. Training activities or structure, which are successful and idiosyncratic to the firm and the conditions it works under, may result in cost advantage for the firm involved. Training is inevitably and indeed usefully influenced by the conditions for its generation and exploitation; in mining, for example, the difficulty of extraction, processing and maximisation of final economically useful material, all influence the level and type of training established (Richter *et al*. (2018), Brown (2019)).

The principles underpinning a firm's training behaviour (adapted from Hobday, Rush and Bessant (2002)) are:

(i) Awareness of the need for specific skills and for the corresponding capacity-building structure and activities.
(ii) Ability to search for, select, absorb, and implement an appropriate training response.
(iii) Ability to create, support or contract competent core training capabilities.
(iv) Development of a skills development strategy that will support the firm's operations.
(v) Ability to learn from experience and operate flexibly through training-change capabilities.

(vi) Ability to identify, form and exploit linkages with other learning organisations, in a way which directly benefits the firm and may indirectly help the same collaborators and others.

The choice of whole training model (systemic acquisition) or of component parts of the model (training component acquisition) is the basis of what comes later in the medium- to long-term: a stable, cyclical or turbulent training environment. This choice could be the result of an over-emphasis on the perceived status of the model source (e.g., an industry leader) instead of actual performance or results achieved, the poorness of the firm's selection criteria, the lack of effort to find or adapt options, or the relative absence of adequate alternatives. How this is implemented usually depends on a stage-by-stage advance: to refocus Ishikawa's model a little, the beginning of the process could be, (i) training is copied but with reduced quality, (ii) the copying occurs without a reduction in quality, (iii) with improvements, (iv) major improvements, or (v) original input (Ishikawa (1985: 58), Hobday *et al*. (2002), Nordhaus (2014)). The "radar" that the learning firm has in place to identify and corroborate training quality and appropriateness is very important in these circumstances.

Basic ingredients of the training regime:

(i) Abundance (or, as the case may be, dearth) of training knowledge.

(ii) Cumulativeness: Conditions exist that allow a firm to evolve its training offer based on the stability and prosperity of its current training regime; and there is a flow of input, constant or irregular, from within the firm or interfirm system, or from outside it.

(iii) Appropriability: Training often has low appropriability, thus facilitating training knowledge externalities and spillovers (Lavie (2012).

(iv) Nature of training knowledge: Knowledge may be embodied in codified, tacit or mixed form, affecting its transmission capability, relative dynamism (tacit) and standardisation (codified) (see similar ideas in Groenewegen and van der Steen (2006)).

Within the institution(s) that house the firm-level, local or sectoral training system, there are three basic components: (i) training knowledge and technology, (ii) training agents, learners, stakeholders and organisations, and (iii) networks between these participants (adapted from Malerba (2000, 2002)). I would like to go beyond this by listing what appear to be the main forms of learning that influence the assets and systems that make up training knowledge: education, skills development, knowledge acquisition, knowledge creation, knowledge transfer, absorption, diffusion and experience accumulation (Bell, 2007: 7).

What are the typical weaknesses when a firm starts capacity building? There exists the risk that whatever training system is established either at the firm or interfirm level, that the primary impetus behind it is an ill-considered and poorly developed framework of ideas emanating more from “faddish” or “herd” thinking and criteria, and financial or other (including legislative) influences. This does not bode well for the efficacy of the training project as a whole. In its early stages, capacity building is characterised by uncertainty, situated as it may be between hopes for its utility and fears that it is wasteful of needed resources; and this lack of clarity is not aided by but may disguise poor preparation, inexperience and inappropriate inputs.

More particularly, if the training experiment itself is sponsored and developed by one firm pretty much on its own, the risk (or at least the sense of risk) is higher *for the firm* because of the unknown outcomes and smaller scale assumed *on its own*. On the other hand, there are companies whose institutional capability is extensive and experienced enough to take on this challenge and carry it out successfully on their own. This idiosyncratic, firm-level risk is different from the cluster risk in that the first involves one firm

(with its limited resources and knowledge base, etc.) and the second a collective configuration of firms and institutes (with their greater shared inputs of expertise, personnel, knowledge, budget and self-confidence) (Campbell *et al*. (2001), Mazzucato and Tancioni (2008)).

Afterwards, once a certain amount of time has passed and experiences retained, then a given level of skills development memory is in place by which training is improved, management is convinced of its returns, and resources can be invested, the precedent acting as justification. Internally, this is called memory; externally it is spillover of training components or model. In the case of mining, training is often carried out in a skills context that has a large sectoral memory in capacity building, in an industry where physical challenges and the means to meet them are more or less well known, understood and resolved. This is not a new sector that generally requires high levels of innovation in training knowledge or technology (Adeoye, 2015).

Firms which are new start-ups, and even ones which are well-tested but now located in a new environment with unknown local challenges and resources, will learn their training needs and capabilities by performing initial tasks of design and establishment, revision of local skills pool and training provision, assessment of internal capabilities, etc. A longer established firm should ideally have a good base upon which to grow and specialise its training system, however less than perfectly it might do this. If it fulfils the role of local training leader, and if the required infrastructure is in place (a functioning local training support system), then the start-up could be helped to overcome mistakes arising from its naivety in skills development, its inability to reach a minimum training efficiency scale on its own and overall training underperformance.

The chances that the wrong training decisions will be made are high in the case of a new firm or one that does not yet know the environment – community, physical challenges, institutional support, etc. – in which it operates (Briscoe *et al*., 2015). Other liabilities at this stage could include the lack of a mutually supportive cluster of firms and training providers, the

fragile and small-scale character of the first training endeavours, the poor selection of managerial and teaching personnel, and the incompatibility of organisational strategies with the underdeveloped human formation activities that are supposed to nurture them. There is also a possibility that a new training system can start with high rates of return, and of course produce highly impressive achievements such as the transition from semi-literate to semi-skilled to skilled workers, which makes later developments less eye-catching and perhaps less worthy of managerial support. Long-term continuity of the originators' project is an important theme in this respect (Lööf and Nabavi, 2014).

It could be argued that what is important at the beginning of the training odyssey is that the organisational structure, course content, assessment methodology, associated quality-protecting rules and physical stock (i.e., the training system) are all put in place; and that later on, perhaps after some tinkering, the capability to be flexible, timely, specialised, upskilling and innovative (i.e., the training process) take on an importance of their own, on the back of the firm's better understanding of and self-confidence in its training system, and the related phenomena of firm growth, greater technological and related skills sophistication, as well as changes in the wider business, knowledge and social environment (Berkert, 2010).

Looking at matters from a slightly different angle, the survival and growth of the training regime (whether it is dominated by internal or external inputs) depends on the perception of management and their masters on the value of the training undertaken (Ravasi *et el*., 2012). If novelties in the training offer are observed to be beneficial to company growth and profit-making, then there is no reason why it should be limited or barred. But on the other hand, a firm cannot long permit a situation in which the skills formation department is a type of laboratory of training experiments that have few positive results and take the place of other activities which have been seen to be more successful. The existence at the local level of either rudimentary or sophisticated training provision, at the sectoral level of

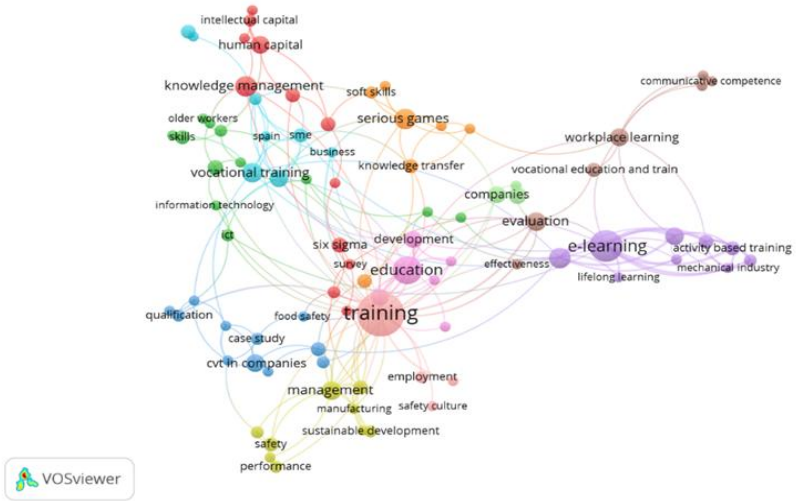
developments by collaborators and competitors in the field of skills development, and at the national level of skills-supporting institutes, will also affect this scenario.

There is no inherent reason why the training system should not grow proportionately with the expansion of the firm, on the simple logic that a rise in staff numbers will lead to an increase in trainee numbers. An increase in the numbers of employees, a greater plurality of education and skills, and developments in the operations and equipment/technology of the firm will all play a part in *pulling* the scale and levels of the training system. Whether there exist the management recognition of the skill development response required (Lee *et al*., 2001; Shane, 2003) or the funds available is, of course, another matter (Fai *et al*., 2018).

2. *What is the role of the firm, and how active is it, in training provision?*

The subject of training specifically within the company (intrafirm) involves the following main themes suggested by our bibliometric search (656 documents): human capital, knowledge management and transfer, soft skills, information technology, work-based learning, virtual training, activity-based and lifelong learning (lifelong learning), case use, and grades.

Fig. 2.3. Training in the company: 656 results of documents



We would attempt to categorise firms which participate in skills development by dividing them into three types:

- Training "manufacturer" – Those firms which create the syllabus, assessment procedures, materials, reading lists, equipment, management structure, etc.
- Training "provider" or "retailer" – Those firms which have their own in-company skills development provision or which are providers of capacity-building services.
- Training "consumer" – The firm, groups of employees or individuals who actually participate in skills formation.

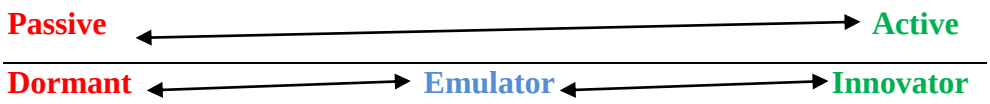
These can of course be one and the same organisation, in the sense of having full in-house self-sufficiency (which normally only a very well-established, large company possesses). Alternatively, the first two could be a single provider contracted by the consumer-firm to give training in the company's premises, or offering certain services in the provider's own facilities. If it is an outside agent and charges commercial rates, then it is a retailer-provider rather than an in-house provider. The question of relevance to specific firm needs and administrative input would be crucial issues here. But countering this could be a recognition that a firm is unable to perform all three roles or that it feels that its core activities should not be weakened by dispersing resources to skills formation.

It is important to realise that a firm might have to become a "manufacturer" or "provider", though it might not feel entirely competent or committed, simply because there is little or nothing else available. However, at the end of the day, power resides in consumption as it is this category that most of the decision-making (and finances) is located. An interesting configuration involves the firm as final consumer becoming actively involved in the manufacture and provision of the training offer, in such a way that the offer is firm-specific, responsibility is shared and a mechanism that facilitates continuous updating is put in place (Graf, 2011). The question is, how good has the manufacture and provision been in response to consumer

pressure, and what is there to substitute them if necessary? A dangerous situation in this context would be one where there is mutual dependency between firm and training agent, and no credible alternative should one cease to operate (this is not so bad if the agent is of a poor quality, a different matter if its services are worthwhile).

The participation of a firm in capacity building can range from extreme passivity up to highly active. According to where they are situated in fig. 2.4, they could be described as dormant, as emulators or as innovators, though with mixing of intensities occasionally or habitually.

Fig. 2.4. Training "intensities"



This level of commitment and participation in the training undertaking itself depends on a number of factors:

(i) Stakeholders in the decision-making and follow-up process

(ii) Employee profile and cooperation

(iii) Perceived internal needs and acceptance of skills development as a solution

(iv) Commercial and financial conditions

(v) Inputs by external providers, government, community, interfirm cluster, corporate headquarters, etc.

(vi) Allotted budget (possibly with a promise of long-term commitment)

(vii) General firm dynamics (e.g., propensity to be passive or active)

(viii) Autonomy of training section and collective support it receives

(ix) Ability to adopt, abandon and innovate in a timely and astute way

(x) Other factors.

We might describe a firm as a training innovator if, for example, it has created part or most of its training system through its own creativity, exigency or appreciation of its condition. Most firms have to be innovative to some extent, as circumstances which each confronts often require a certain innovative response. This response could relate to a particular course design or a new assessment method that is fairer to the particular strengths and weaknesses of the given participants. If the training operation in the firm is of a sufficient critical mass and competence, then perhaps innovation can be facilitated more easily when necessary (Carnahan *et al*., 2012).

In terms of in-house provision, the work that is undertaken by training managers could relate less to the creation and development/innovation of a firm-specific training offer and more to the appropriation of a training capability. The size, budget and personnel of a firm, and the existence of an external resources and providers would all influence this practice. Other key external inputs in this activity would be intermediary ones involving assessment and testing, etc. However, the contrary might happen: if the firm has cultivated the capability as well as the tendency to take advantage of in-house resources, then again a specialist scope for innovation might take place.

On the other hand, if the firm devolves most of its training to outside provision, the innovation along with its appropriateness are somewhat at the mercy of the provider. Lastly, one might expect the possibilities of training innovation analysed and designed by a group within a relatively mature training system (whether firm- or cluster-level) would be greater than in a younger, dynamic but inexperienced regime.

Training can be said to have different positive roles in the growth of a firm. For example, if one looks at it in terms of human capital theory, more and better training should lead to higher productivity. However, a lower productivity does not necessarily mean that training is responsible as there are other factors: the most obvious one being a slump in sales and therefore

commodity demand and income (Taylor and Lybbert, 2015). In fact, in human capital terms there appears to be a positive relationship between the level of productivity growth and the progression of employees through the different levels of specialisations of training (see the remarks of Clarke (2012). Similarly of course, there is a mutually beneficial relationship between investments in physical capital, R&D, organisational development, different forms of knowledge research and other "capacity components" (Bell (2007: 2); see also Madsen and Timol (2011)), and so on, and the level and choice of training offer.

Another important aspect of skills development has to do with the convergence (or catch-up) model, a situation in which diffusion of better practices and knowledge through training – aided internally by investment, physical capital, stock of human capital and labour, and technology level (Wolff (2001), Bacchiocchi (2010)), and externally by commercial/trading relations, local support structures and advantageous political conditions – permits a firm to take advantage of resources, new productive techniques and technologies (Hsiang and Jina (2015), and Mowery *et al*. (2015)). The last categorises these characteristics as forming "social capability", an important point when analysing the importance of skills spillover that basically originates in training)

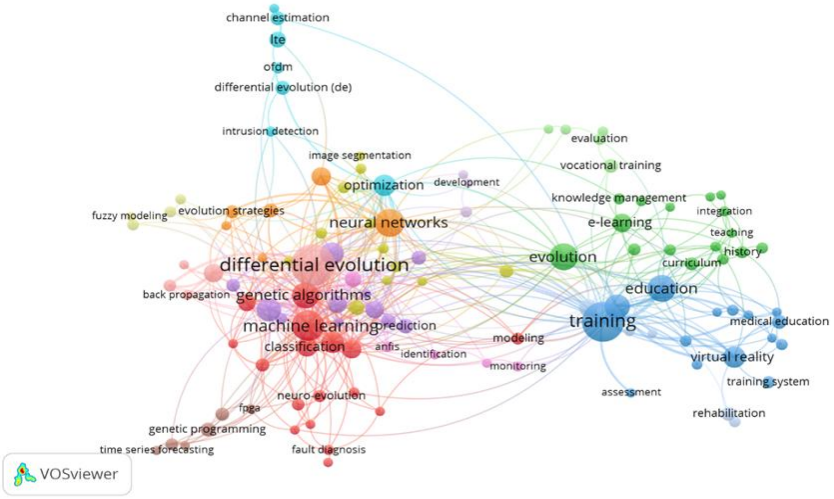
A question that is pertinent in the context of the effect of different levels, types and applicabilities of education (primary, secondary, technical/vocational, tertiary) is, does vocational training have a significant effect on the firm's efficiency, profits and growth? Indeed, one might extend this inquiry by asking whether a current high productivity level has initiated and supported a training culture in the firm, or whether this productivity is largely the result of previous and ongoing skills formation. Furthermore, is it important to break down training into different skills and focuses to analyse this properly? Departing from the long-held theory that learning is easier and produces greater efficiencies once there is a reasonably strong base in place (Arrow (1962), Clark and Nilssen (2013)), is it possible to say that basic

training for the low-skilled (to give one example) has a more or less assured probability of improving working efficiencies, productivity and income in the long-term? And later, is it the platform from which continuous learning (in the form of upskilling and so on) can be achieved in a competent way and keeps producing "goods" for the firm?

3. What is the possible evolution of the training system after its initial establishment?

The fact that this is a topic with a wide range of implications is reflected in the large number of publications that address the subject: our research found 4,690 publications that directly or indirectly relate to the topic. In one field of research, the main topics are education, virtual reality, the training system itself and evaluation. Evolution is an important topic in another field, which also includes e-learning, and knowledge management and integration; and other issues of relative importance are differential evolution, classification, and even genetic algorithms and neural networks. It is obvious that some of these more advanced activities are aimed more at training that takes place in developed countries and not so much in poorer countries where such sophisticated questions, for practical reasons, are not a priority.

Fig. 2.5. Evolution of the training system: results of 4,690 documents



The content of the training system (its organisational structure, syllabus, assessment procedures, equipment, installations, etc.), when properly established, can be relatively stable and follow human formation and technological trajectories, so long as a radical occurrence does not intervene. This occurrence need not be detrimental. The radical variance could be the arrival of training staff with new ideas or recruits with learning needs that are not covered by the current system (and there is an argument that contends that radical changes will only occur when new experts are brought into a company (Su *et al*. (2013), Teubner (2017)); developments in methods, workplace know-how and equipment (both in the teaching and the associated productive fields); radical new training knowledge, and so on.

The rate of change might well have been quite quick at the beginning, before settling down so to speak; corrections and new directions might have been common practice at this juncture. Later, instead of large modifications, the emphasis could be on "cumulativeness" as the prior work is found to be a good foundation upon which new courses and activities can be built (McFadden, 2008). In the case of certain industries (such as mining), it could be argued that certain skills objectives exist and that the methods and means to reach them are well-tested and reliable. While this might appear patronising to the specific complexities bundled within a firm and may support some degree of complacency in practice, it does not appear to be discredited by comparison with a range of industries and their regular rates of innovation and range of activities.

I would like again to develop some ideas that go beyond current literature. With regard to the rate of development of the training operation, the question arises whether and to what extent "cumulativeness" in the skills formation project exists, as well as training routines and collectively shared training frames (akin to those mentioned by Spillane *et al*. (2011)), This suggests that there may exist training routines and collectively shared training frames, obviously with certain differences of emphasis and

adaptation by each firm in the collective. There could exist, in practice, "fixed" training inputs such as the organisational structure, assessment methods, etc., and "variable" ones that are readily adaptable (instructors, new courses, training equipment, etc.). The procedures by which these inputs are managed might be constrained by habitual training routines or the new mix might be allowed more procedural latitude: confidence in procedural precedence must be weighed against the possible benefits of low-risk experimentation.

Conclusion

The training system can only be viable, credible and innovative when it is related to that living and voluble organism called the firm. It is a consequential construct, in the sense that what it does is not performed in and for itself but is designed and carried out according to real-life company-level and market demands. Though there may be present such considerations as obligations related to licensing and CSR, and though the repercussions of the actual skills development itself might go beyond the walls of the firm as some sort of spillover to other enterprises and the community, this consequential relationship identifies the bottom-line of human capital formation in the firm (Briscoe *et al*., 2015). Of course, once it is competently established, the relationship works both ways – a consequence of good training is an improvement in the firm (that is what makes it "good") and a justification in continuing the service – but the needs of the firm will always be paramount.

Training can involve such elements as infrastructural issues (e.g., finances, company policies, management competence, etc.) and the more vague but crucial superstructural matters of labour and interpersonal relations, knowledge sharing, skills competence and systemic cooperation. There are both "closed" or "imposed" reasons for establishing and innovating a training regime, and "open" or "proactive" reasons, with both internal and external origins. The first type ("imposed") includes such pressures as

finances, schedule, “rules” (legislation, company policy, local customs, etc.), external conditions (physical, market, etc.) and human resource limitations (skills level of current employees and trainees, and that of potential employees locally; plus in-company and external training capabilities).

The large, contextual forces that directly affect the design, implementation, performance and outcomes of the training system are economic stability, regulatory conditions, competitive markets and investment climate, as well as resource provision, private institutions, standards and qualifications, and public services and funding developed and managed by government (Gallacher, 2012).

This list could be extended to the influence of sectoral and local associations (trade, community, skills improvement and awarding bodies, etc.) and donors (particularly those partly governed by the concept of knowledge-based assistance (King and McGrath, 2004)), as well as inputs from head office decision-makers. The second type (“proactive”) is often more a matter of good fortune (or at least the positive consequences of good preparation and staff selection): personnel input based on motivation over inertia, preference for novelty over status quo, creativity, capability diversification and critical assessment. This latter dynamism could be critical should the firm wish to be flexible in the face of unpredictable volatilities, enter new areas of activity having perhaps reached a certain equilibrium or limit in its commodity-centred activities, or improve organisational linkages and HR capabilities through which production-related knowledge can flow.

To justify the initiation and/or continuation of firm-level training, it is important to address the relationship between the level of productivity growth and the progression of employees through the different stages of training. The comparison between training effort or inputs (embracing the whole structure and effort to instil needed practical and intellectual capabilities in the trainee) and training outputs (increased productivity/profits, skills abundance and flexibility, etc.) will give

management an idea of how well the experiment is working. The data could be incomplete, incorrect or misinterpreted; additionally, there could exist wilful prejudice against the whole non-core business nuisance of a training commitment and its long-term strain on resources.

But if done well, the contrast could be quite fair and unarguable. One complication in this assessment is the time-lag issue: the question as to how long a firm should wait to make a fair comparison (Hall *et al*. (2005), Bacchiocchi y Montobbio (2010)). Another complication is the simultaneous occurrence of a powerful effect (e.g., sudden strong commodity demand) that influences whatever outputs are being measured, but has little or nothing to do with the training being evaluated and perhaps goes unreported as irrelevant to the issue being analysed.

Section 3

Title

The Richness of the Training Spillover: When the In-Company and Interfirm Training Systems Get Married.

Summary

The article focuses on the question: can you create a successful training system between companies geographically close to each other? The topics are: the possibility of a training system within companies (or "intrafirm" training); the positive impact on the performance of training derived from geographical proximity; the nature of the interfirm training group; the role of foreign and multinational companies; and finally the role of training providers. The article looks in depth at training knowledge spillover, the returns on this activity in terms of the cultivation of skills and other measurable factors, and the importance of such elements as the costs involved.

Key words and phrases

TVET, Technical and Vocational Education and Training, In-company Training, Interfirm Training, Returns on Training, Training Costs, Training and Wages, Training Appropriability, Training System, Training and Employment, Training Cluster, Developing Countries, Multinational Companies, Training Providers, Skills Spillovers, Tacit and Codified Knowledge and Training, Return on Investment in Training.

Introduction

Training in itself is generally not characterised by such constrained means of appropriability as secrecy, patents, continuous ground-breaking innovation

and the dominance of complementary assets, as described in similar contexts by Su *et al*. (2013); rather it is eminently discoverable, available, transferable, adaptable and updatable. No matter what the general firm capabilities and on-site circumstances might be, ideally there should exist a recognised minimum level, content variety and amenable source of the required skills development. If done well and conditions are favourable, skills formation can be built up in stages, leading to increasing returns if carried out continuously and adapted to specific firm-level needs (Hage *et al*. (2013), Anadon *et al*. (2016)).

We can look at this further at the level of the firm, sectoral and non-sectoral cluster. Even if the training system within the firm is well-developed but focused towards in-house needs and practices, it might still possess a high level of appropriability, particularly if its accumulated constituent components are not diffused but are amenable to this. At the same time, some amount of diffusion might have advantages especially if competitive implications are not strong. At the broader interfirm and sectoral levels, if the shared training is extensive and well-endowed, then this indicates that widespread externalities exist: that interactive and diffusion activities – perhaps within selective limits based on competitive fears (Groenewegen and van der Steen, 2006) – would appear to be normal practice. Finally, looking beyond sectoral limits but still at the local level, the existence of a well-developed skills formation regime suggests that diverse local firms and institutions have separately and/or in partnership accumulated training capabilities in a network of localised training externalities.

On this subject of appropriability, the fact that the training knowledge is sourced internally within the industry should mean that it has reduced obstacles to and costs of access, on condition that the accessing firm is sufficiently competent to locate and use the knowledge. Going beyond what Stiglitz (2011) says on the subject, if this knowledge comes from outside the industry, there may be problems of adaptability to a dissimilar environment

but one consequence might well be that it enriches the training knowledge stock and inspires innovativeness. Furthermore, new training knowledge may build on current knowledge in a process of cumulativeness.

In this situation, what a firm learns about its pooled skills and skills gaps is delineated by the learning process related to its organisational capabilities and returns on skills formation, and external feedback (Malerba and Orsenigo (2000: 301), Lahiri and Narayanan (2013: 1063-64). With this clarification, it can with some confidence then invest resources in taking what it hopes is an advantageous trajectory of skills advancement. In the localised context, a primary source of this cumulativeness may come from external agents, through spillovers (which are often now unhindered by distance) and the input of local training providers. Internally, the incremental additions to the training system may be the result of new personnel, new equipment requiring talents not covered by current skills, or (more generally) the institutional habits of continuous skills accretion and innovation, and the associated systemic maturity or immaturity in the field of skills development within the enterprise. A simple factor such as restlessness about the lack or absence of skills, and training remedies for this, may be present among decision-making personnel. These additions could be so novel that they are "new-to-firm" and more broadly "new-to-locality" training components (OECD, *Oslo Manual*, 1992/2005, paras. 199-210).

One of the more socially beneficial aspects of training is that the sort of legal protection relating to property rights, and the tendency not to collaborate or share such knowledge as innovations or best practices that work, do not exist to such an extent in the field of human capital formation. At the same time, however, there may exist a firm-level preoccupation with regard to the loss of trained personnel, perhaps to local competitor firms. One question in this regard concerns the equitable investment in and, following this, distribution of benefits resulting from capacity building, especially if one firm among the co-localised group is investing relatively large amounts

of capital and effort in the activity but seeing not only in-house benefits that may be low in proportion to the investment, but actually that aid is being given in effectively subsidised skills formation, and perhaps headhunted individuals, to other firms whose contribution might have been relatively slight.

By contrast, there are definite social benefits to this disproportionate sponsorship of the collective training system. There might even be some value for the responsible firm in upskilling neighbouring enterprises. In this respect, business linkages that are clearly advantageous to a firm will encourage that firm to invest more in the training project, even if there is an inevitable high spillover effect, on the basis that compensations in the form of more efficient suppliers, buyers and other business partners will ensue.

Results and Discussion

Skills vs. Training Spillover

There are many types of skills and training spillovers emanating from within firms and interfirm clusters, which positively influence both firms and the local community. We must clarify that they are not the same. There is a difference between skill overflow and training overflow. Undoubtedly, they produce similar consequences in that they involve a certain population of men and women capable of working efficiently and skilfully in a particular productive activity that is subsequently compensated. It may be the case that the training itself spills over into the diffusion of skills; after all, training is the prior activity that leads to the presence of skills in the person who has participated in the applied education process. The skilled person might have reasons – the lure of higher wages, lack of job satisfaction or promotion, and even boredom – to leave their current position and move to another establishment, somehow exporting their skills and knowledge to the new place. To give a concrete example: a company could direct a training

provider to create a new mining practice programme, based on customer emphases and preferred techniques, and this could be retained by the same provider and then offered to other customers. This is a type of training spillover.

In the bibliometric analysis we discovered more documents on skills than training spillover (329 vs. 225 – figs. 3.1 and 3.2 below). In the case of the spillover effects of training, what is striking is the strong influence of foreign direct investment identified in a considerable number of articles. Other important topics were innovation, diffusion of technology, productivity and entrepreneurship, backward linkages, cooperation between participants, and company performance. On the contrary, the issue of skill overflows was related to activities such as human capital, knowledge overflows (which imply its management and tacit and codified incarnations), wage inequality, gender and balance between work and personal life, as well as foreign direct investment, trade and multinational companies.

Fig. 3.1. Skills Spillover: 329 documents

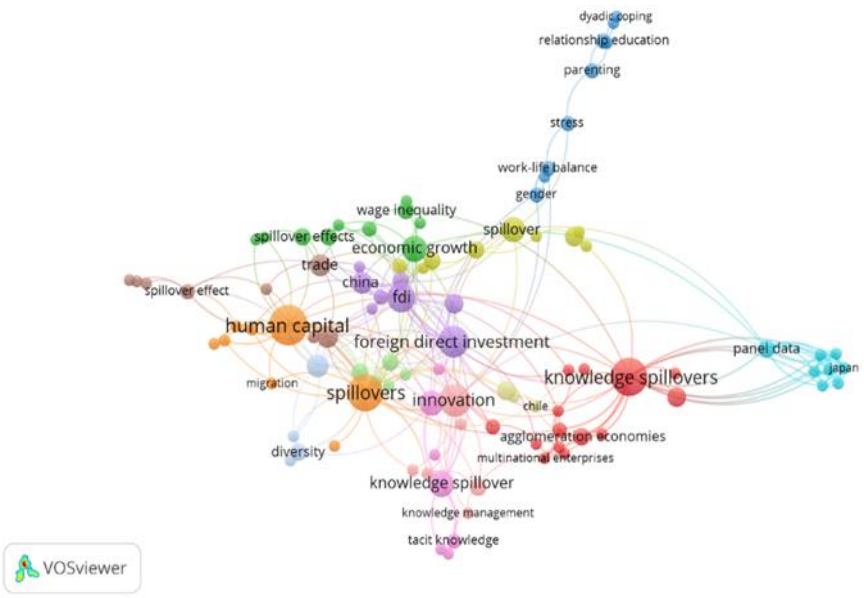
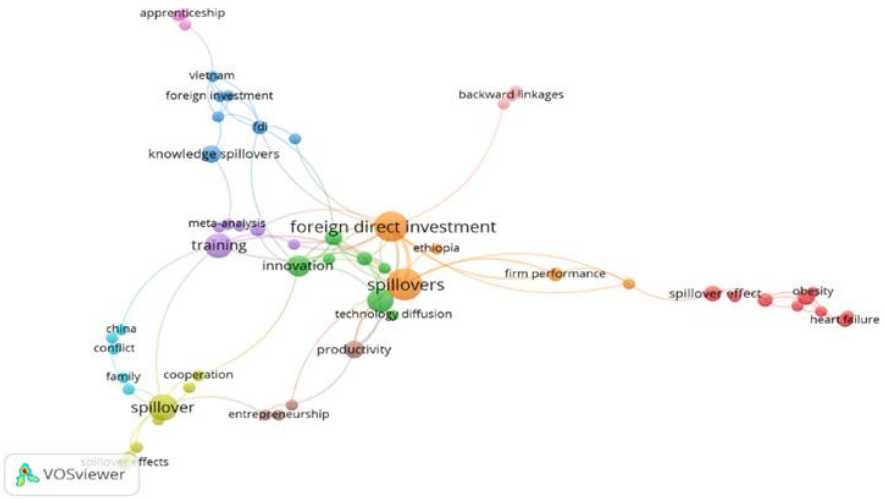


Fig. 3.2. Training spillover: results of 225 documents



There are different types of spillover, some with negative repercussions for the training firm, others with positive ones. It may well be part of the initial learning project that the training undertaken should be so designed that an internal "skills domino effect" will occur, a spillover phenomenon embodied in the trained employee as a skills model or mentor for his co-workers. Another useful spillover, this time flowing from the firm to another firm or institute and usually quite codified and with medium- to long-term commitments on behalf of the donor firm, is the transfer of a skills development "package" to an organisation (e.g., a competent and firm-specific provider), whose subsequent newly enhanced training knowledge and performance will benefit the firm itself and, expectedly or unexpectedly, other local firms.

At the other extreme, if the firm fears that the training it implements will likely be a passive loss (trained workers leaving to non-competitors) or a negative loss (workers go to competitors), then this expectation (perhaps justified by past experience) may result in underinvestment in training, which effectively involves a vicious circle.

How does the training knowledge spillover work?

There are many types of training knowledge spillover, the following are just examples:

(i) Spillover of skills knowledge within the firm, through in-company training, formal OTJ, informal imitation of colleague's working practices, etc.
(ii) Spillover of codified training knowledge within interfirm complex.
(iii) Spillover of trained personnel to other firms, local or further afield.
(iv) "Net loss" spillovers, "net gain" spillovers, "equilibrium" spillovers.
(v) Spillover that encourages training culture.
(vi) Spillover that substitutes for training.
(vii) Incubator spillovers.
(viii) Private and social spillovers.

Factors such as geographical proximity and sound communication channels between the firm and other firms and providers are important, but these will have limited impact if the knowledge or service offered is of a poor quality or just inappropriate to start with. The challenge would be to improve this stock, perhaps increase the range of options available, and keep costs within reach, while at the same time maintaining internal learning mechanisms as a source of training needs and firm-specific input, all in a reciprocal relationship (Zhu and He, 2014). In this way, the external training system can likewise potentially be influenced by a firm of an adequate size, capability, dynamism and focus in this interdependent chain.

In a collaborative situation, the transfer of information and skills can be erratic or constant depending on whether it occurs through spontaneous/fortuitous acts or more deliberate cooperation. The presence of mutual benefits for this activity, and clear recognition of this, makes a

scenario of at least limited facilitated spillover possible, in stark contrast to other types of collaboration that are underdeveloped due to competitive and ownership issues, or lack of conviction concerning the projected positive outputs. This finds a parallel in the deliberate, managed spillovers of technical information and knowledge that has been assessed by numerous authors (e.g., Caniels and Romijn (2003: 1269-1270) Van Long *et al*. (2014: 1127-1128)).

The nature of the sector in which the firm operates – its sectoral training history and the pool of training components within the sector itself – is another important factor: external to the firm but often deeply ingrained in its internal or localised training system through the people who run the system, their sectoral background previous to the current job, and the range of choices they look at and feel most comfortable with. Other influences may also come into play in this regard, such as the stage of the industry lifecycle (Schmelzle and Tate, 2017) and the achievements of training innovation in other industries applicable to the one in question: in this context, Tavassoli and Carbonara (2014) talk about inter-industry knowledge spillovers.

Due to the mix of the sheer size and importance of a particular firm (e.g., a mining company) and its remoteness from alternative sources of modelling and leadership in fields like capacity building, in the best scenario its geographical and employment dominance should lead to positive monopolistic activities and spillovers, such as training. In a similar scenario, if a particular programme of training is created by a firm which subsequently allows the firm to undertake profitable tasks that others are presently incapable of doing, then this “monopolistic” training advantage might spur these other firms to imitate their rival and implement focused and timely remedial training.

This is an important point: the inevitable differences between upstream and downstream training systems. The structure of incentives and needs that relate to firms specialising in upstream activities – such as a

mining company – play a central role in generating a training system that is bound to be different to the one that operates further downstream among firms dealing with finished goods. In fact, this is an area of study that requires more work, progressing further than researchers like Scott and Storper (2007) and Lagos and Rosales (2013), to analyse how training is affected depending on its location in the chain. The upstream-downstream relationship needs to be looked at in some depth. There are vertical externalities affecting the direction, level and rate of training that a firm will offer, particularlyones that are located upstream. This occurs through the dynamics of the division of labour: because an increased demand by downstream industries will lead to increasing levels of division of labour among upstream firms linked to them and from there to higher levels of specialisation that respond to market preferences and volumes (Antonelli (2008), Yu and Oliver (2015)); and this will in turn influence the resulting reaction in the field of skills development. The division of labour may permit the subsequent modularisation of more specialised training addressing changing working domains and the participation of a wider variety and (perhaps) higher quality of training agents (Chan *et al*., 2017).

Similarly, whatever improvements are made by a firm located upstream in a vertical system may cascade to other firms further downstream or they may spread out horizontally to firms located locally (Van der Panne and Van Beers, 2006). This might arise because the responsible firm is so locally or sectorally dominant (sometimes in ways that may have little or nothing to do with skills enhancement), has developed an exemplary training model, or has training strings attached to doing business with them.

The presence of a sufficiently large single firm (e.g., a huge mining company) or group of firms (perhaps interconnected by business dealings and common sectoral focus), acting as a sort of “anchor tenant” (Feldman (2003); see also Graf (2011: 173-176)), might lead to an economy of training offer and indeed specialisation directly related to training market demands.

For like reasons, these localised firms will attract and, through training patronage of some sort, create a pool of workers with the required skills. One must look at particular cases to assess if this world of functioning pecuniary externalities actually exists and how well it functions if it does. The "geographical coincidence" (as described by Jaffe, 1989) of firms/training providers and the consequent improvement in production requires careful measurement to make it credible and similarly proper assessment to make it capable of growth and imitation (Benjamin, 2018). In addition, this study will also show that, as a type of localised knowledge spillover (surveyed both in terms of intra-industry and inter-industry spillovers by Feldman (1999), Ho (2012), and Gérard and Uebelmesser (2014)), training knowledge has a range of influence beyond which it weakens and dissipates: what Anselin *et al*. (1997) call in the context of the spillover range of university research a "spatially lagged variable".

There are two possible outcomes to the implementation of a training regime from the point of view of the firm: "train-drain" and "train-gain." The first involves the following outcome: if the training has been successful, the worker is more capable in terms of skills, knowledge and attitude, and either has sought and found employment outside the original firm, or is poached by another firm (parasitic and unfair to the first firm but making full business sense) – or, indeed, for any reason, has just left. The second embraces not just the worker who now has greater competence and remains in the firm, but also the structure and methods, the training personnel and the current trainees who all exist and are justified to some measure because the training was successful and the expertise of the programme "graduate" was not lost in the end.

Occasionally, a spillover "drain" could be defined as such only in the short-term, with net benefits coming later; or it could involve a misinterpretation, in that what might look like a loss might in fact not be a loss at all but rather a convenience (e.g., the departure of trainees for whom

a position in the firm that provided the training was not available at the end of the day). Another aspect of the drain-gain conundrum is the question of utilisation of skills for those employees who stay but who find that the new or enhanced expertise they now possess is not being properly used because working practices or technology are (for example) at a level lower than their new abilities, or their skills are inappropriate in the context of recently changed organisational, equipment or market circumstances. This could occur because of a lack of communication between the shop-floor and the training outfit, an over-ambitious skills regime, or a deliberate overskilling that anticipates future developments – there exist a multitude of reasons. In addition, the fact that the firm has a reputable training regime could be a factor in attracting in recruits, particularly of the more motivated sort. Finally, one has to think of the bigger picture: what is a drain for the individual enterprise could be a local or sectoral gain.

What are the dynamic increasing returns on training spillovers?

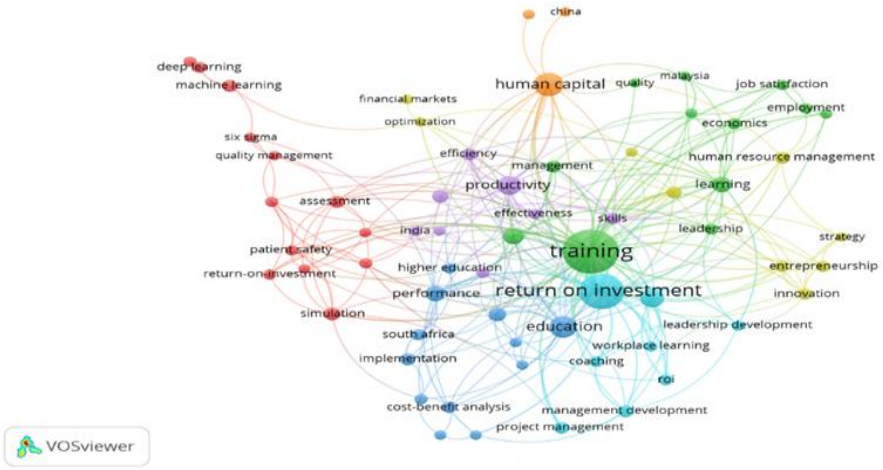
A well-run company will assess their training needs with at least three approaches:

1. What skills will you need to improve performance and ensure profitability?
2. What provision of training will you need to accomplish this and where will it come from (internally or externally)?
3. What will this activity cost and is it worth it in terms of subsequent revenue projections?

The published literature on this topic is relatively extensive (1,389 results – fig. 3.3). A wide range of approaches are of more or less equal importance: productivity, effectiveness, efficiency and skills can be grouped together; likewise, the analysis of performance, implementation and cost-benefit; quality management and return on investment are also somewhat linked, as

are optimization and financial markets. Learning in the workplace, coaching, and leadership development are also represented, as are entrepreneurship, strategy, and innovation.

Fig. 3.3. Return on investment and training: 1,389 document results



On the subject of spillovers, the question of the level of "dynamic increasing returns" as a network effect is important as it involves the capacity building of trainees internally and directly by a firm or interfirm-level system; and, from a wider perspective, also those from outside whose skills development is the result of the linked domino effect of the original training provision. The difficulty here is an obvious one: how does one definitely relate the outside capacity improvement as being a result of the firm-level provision? One misunderstanding to do with training spillovers is to interpret a simultaneous but unconnected training project and its results in one firm as the consequence of tapping into the system and personnel of a neighbouring and perhaps rival firm (Thomä and Zimmermann, 2013).

Another difficulty here concerns the imitation of a particular training activity or model, which is not in fact the best option, simply because it is used by a dominant firm or, in the context of a dearth of other alternatives and guiding criteria, it appears to be the best option – this is reminiscent of studies of comparatively inefficient technologies that were "locked in"

because of apparently high returns (see Paul David (1985), John Hall *et al*. (2011)). This represents one of the systemic weaknesses of a network relationship in which one or a small group of capacitating firms may be leading the follower firms in the wrong direction, at least when judged in the context of the specific circumstances of the latter. The choices made by training opinion leaders, after all, may be more believed than alternatives tested through certain criteria to be better suited to current conditions.

If it is the case that spillovers are highly localised and quickly decay over distance (Rosenthal and Strange (2003), Freedman and Kosová (2012)), then the implication is that the more remote the firm, the lesser the spillover effect; or equally, the spillover effect is reduced if the pool of firms nearby are few in number, or are incapable of participating or uninterested in the spillover. Of course, one spillover effect is the encouragement of new training offer growth and the development of existing offers. This distance-sensitive, training-knowledge sharing can operate at the same time and place with agglomeration effects that include labour market pooling and input sharing (Breschi and Lissoni (2001), Arzaghi and Henderson (2004), Veeramani (2014)).

One aspect of the spillover effect that should not be overlooked is that it does not have to be only in one direction: for example, it may be the case that a dominant firm produces spillover effects much more than other organisations (firms, public bodies and training providers) at the beginning, but there may be a return on spillover investment for the same firm in the long-term, perhaps if only in terms of the much improved localised training system constructed on networks and shared norms (Huggins and Thompson, 2015), and the reconfigured skills pool and community mindset.

A network effect of a firm- or interfirm-level skills development system are “dynamic increasing returns” involving the capacity building of trainees. This concept is used in many related fields (Aharonson *et al*. (2007) Ottaviano (2011), Nordhau (2014), Binder and Bound (2019)) and could

usefully be employed here. All the preceding could be described as involved in increasing returns to positive training externalities (Nordhau, 2014). Another aspect of this issue involves the question of the timeframe for developing an operation (e.g., a mine) and the activities associated with establishing and operating it. If there is a certain hurry and a training system is established very quickly through local sources, then due to the concentrated amount of time and limited geographical involvement, the effect will inevitably be localised. Over a longer period, and perhaps buttressed by positive information externalities (Aharonson *et al*., 2007: 89) and the patronage of local political or business leaders, a wider effect could occur.

One positive consequence of having skilled and unskilled/semiskilled workers together is that, very likely, the marginal productivity of the latter will grow, not because they have taken formal instruction as such but rather because they are operating in an interdependent productive situation with more skilled colleagues. This is the most common type of intrafirm spillover. This would be the case, for example, if skilled employees were assessed to be cost-effective in a knowledge-producing (conceptual) role, and worked in conjunction with unskilled fellow workers active in direct production (execution).

What then are the ways of measuring the intensity of each firm's training activity?

(i) Spending on skills development; sources of financing.
(ii) Number of people with a role in training, either full-time or part-time, from both inside and outside the firm (with a breakdown to analyse this in detail).
(iii) Number of courses, range of skills, levels covered, continuity arrangements, etc.
(iv) Age of training system; its growth and fluctuations.

(v) Existence of strategic plan; place of capacity building in overall firm strategy.

(vi) Importance of internal inputs; in-company vocational and technical education system (should this exist): organisational structure, personnel, course design methods, course content, assessments methodologies, etc.

(vii) External inputs: existence and suitability of local regional stakeholders, their relationship to and influence on firm.

(viii) Effects of training: return on investment, employee and training staff retention, productivity increases (including mean labour productivity), average skills level, labour harmony, training reputation, changes in wage bill, net output, real value added per employee or per worked hour, total factor productivity (see Dosi and Grozzi, 2010: 180-1), adaptability to technological progress and other types of innovation, discounting non-training factors such as equipment automation.

(ix) Spillovers/external effects.

(x) Number of trainees, their initial and current levels, number of graduates from training programmes, percentage still in firm, continuous learning support, quality feedback.

(xi) Recruits from outside; their skills level and needs.

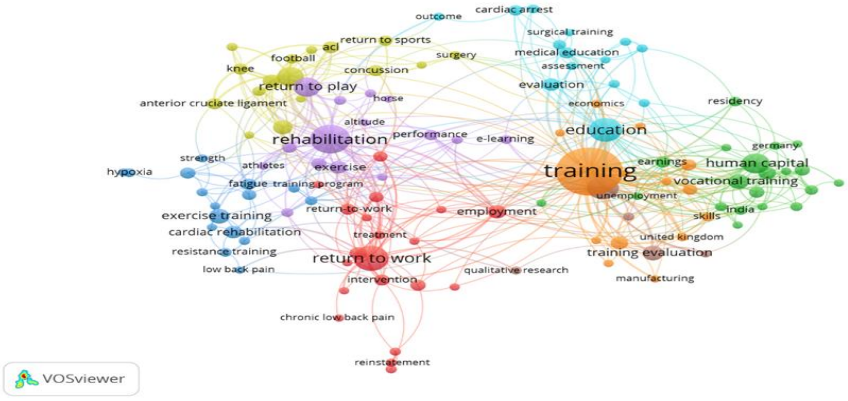
Training could be described as a public good, defined as such because it is relatively non-rival and non-excludable. Where then do competitive forces exist in the training system? The type and quality of training is competitive if the result is a productive level higher than that of rivals, a situation to which the latter will normally have to react. It is also competitive if a training provider has to offer a range of services that are market-specific at a level of price that places them in first place as a provider from the firm's point of view. Certain dynamic providers could have the interactive ability and high-trust relationship that allows them to be preferred over others,

perhaps leading to a species of partnership based on norms of cooperation (discussed in detail by Porter and Stern (2001), Owen-Smith and Powell (2004), and Hage et al. (2013)). In terms of spillover, training procedures and practices might well be the least patentable of all essential and generic activities of a firm, which from a social-benefit point of view is not such a bad thing.

How can returns to training be measured?

This topic is one of the most important in the context of various considerations: of course, in terms of the question of the existence of technological and vocational education and training (TVET) *per se*, as well as other factors such as its sophistication, modality, duration, and benefits for all participants, among many issues. The number of documents on this key topic – 10,888 – clearly shows the role it plays in TVET's analysis and development in real terms.

Fig. 3.4. Returns on training: 10,888 document results



The topic is linked to various large fields in the literature: employment and unemployment, human capital, vocational training and income, education and evaluation/counselling, and return to work.

In the case of skills development, there are two general categories of training performance assessment. The first involves the evaluation that takes

place during the actual training itself. This can be either quite simple if for example it involves informal mentoring of an apprentice; or it could embrace the structured, real-life- and criteria-based, uniform and transparent assessment system that the firm or network has created for itself, or has accepted and perhaps adapted from an outside source: for example, the qualifications framework of an awarding body or that of the local Department of Labour or Education (Keep (2015), European Training Foundation (2019b)). The second category is related to the post-training application of skills learned: the behavioural and pecuniary consequences, the pre-and post-training differences measured numerically and by observation.

Both focuses have their own merits and can in practice be supported equally or disproportionately. They are strongly linked, in the sense that a high evaluation result in a course of training loses its credibility if subsequently the same worker underperforms. Indeed, this reflects very negatively on the reliability of the evaluation mechanisms in general and may lead to the conclusion that what is being delivered is not suitable for firm-specific tasks. There is thus a perennial potential for conflict whose emphasis is dependent on how much credence is given to each category. Of course, if both methodologies agree, there is mutually assured credibility.

The task of measuring returns to training is problematic:

(i) Firms and indeed regions at different levels of development make comparisons difficult and deceptive (Bosch and Charest (2008))

(ii) The relevant training attainment data may not be available or indeed trustworthy. There may also be specification errors.

(iii) Can the presence, expansion or improvement of the training offer be directly related to subsequent growth? There appear to be problems of relating training (and particularly continuous capacity building) to productivity improvements. The more advanced the training, perhaps the less clear are its effects or in fact the lesser its effects are (in other words, decreasing training returns).

(iv) Is the investment in training the best use of funds in order to increase and solidify productive growth? Alternative training methodologies (e.g., on-the-job training or OJT) might be better than more costly and codified classroom-based instruction.

(v) What are the objectives of training in the first place? For example, does the firm wish to increase the range, complexity and quality of the products and services produced? Does it wish to advance into more skills-intensive activities, or require adaptive talent and knowledge, etc.?

These and other questions also relate to the measurement methodology applied to judge whether skills development is necessary in the first place and, when in operation, whether it is helpful in supporting the economic well-being and labour discipline of the firm. The methods that have been used, on their own or in combination, include: return on investment (ROI), gross value added, quality improvement, wastage reduction, performance comparison between the unskilled/semi-skilled and skilled, accumulated training time per trainee, qualifications attained, intra- and inter-organisational labour productivity/training comparisons, training enrolment rates versus attainment outcomes, workforce ability to adopt and use new technologies (Greenhalgh and Rogers, 2010), and regression of productivity growth related to education (this last theme is discussed at length by Hsiang and Jina (2015)).

There might exist a situation in which a certain minimum level of skills – a threshold level – is required as a necessary condition for a firm to survive and grow. Training that achieves this level could then be described as indispensable. Again, the conundrum here for the firm is actually working out when this is needed and the best methods to implement it. In certain places and in the case of certain firms, basic or “primary” training could be the most important vocational education variable in creating the conditions for growth: for example, basic literacy and numerical skills in primary

schools as the basis of all that follows in future learning (Shrivastava y Shrivastava (2014)).

The subject of benchmarking in skills development is a complicated one. Certain bodies place the emphasis on quantitative data when judging training success and perhaps copying it, others on qualitative inputs and results. Something as unscientific and perhaps incomplete as anecdote can come into play when a decision is being made. A firm may well be regarded as a good training model for reasons that have little to do with actual training performance: age, size and sectoral prestige, amongst others, are very persuasive considerations. As such, its influence in this field might be greater than it should, distracting attention from more worthwhile models (Strang (2010), Zuckerman (2012) and Wang *et al*. (2012) all evaluate this in terms of prestigious firms, top performers, and a lack of internal skills-creation mechanisms even in successful organisations, respectively).

Another entirely practical aspect of this theme embraces the question: What are the costs incurred in training? The subject of costs is central to a firm's ability to participate in the training process. There exists in effect an economics of skills development which embraces the investments made in capacity building set against the returns on this effort. There may be some assistance from government or other sources. There is a very wide range of costs associated with training, some of which are easy to identify and quantify, others not: outlay to establish the training system and subsequent running costs, infrastructural costs, loss of productivity costs in the short-term, networking costs, absorption and motivation costs, transaction costs to search for and purchase external training knowledge (be this codified or tacit), and access costs to local training knowledge pool (this last theme is explored by Patrucco (2009) as well as Zhao and Anand (2013)).

Of course, the fact that we can talk about costs of training components emanating from external sources indicates that, though there may exist on occasion some degree of appropriability, proprietary training knowledge is

not usually that restrictive, and that there is a relatively good flow of information concerning such matters as best practices. The peculiar competitive environment that firms find themselves in may affect their propensity to share their training knowledge but there may be sectoral/interfirm advantages for all participants in collaborating in a networked training system, for example in creating what might be called a "critical training mass" in remote regions.

Training systems taken from an outside source have both imitation costs (Biswas, 2015) and absorption costs (Cohen-Goldner and Eckstein, 2008). Furthermore, to this should be added other governance costs embracing transaction, interaction and communication outlay (Antonelli (2006), Ibrahim *et al*. (2009)). The good news, though, is that reproduction costs less than initiation or generation (both Felin and Hesterly (2007) and Dosi and Grazzi (2010) discuss this issue at length).

Conclusion

Training has as its objective a series of outputs that are defined by how they are measured: return on investment, productivity increases, quality improvement, widening of firm-level capabilities, etc. These are in turn the result of selected inputs that create, sustain and control qualitatively and quantitatively the training system itself: physical and financial capital; administrative organisation, managerial and pedagogic capability, and different types of knowledge (of human formation, market, technology, etc.). Another knowledge input is consciousness of more skills development components than the firm is actually putting in, as a contextualising device to allow assessment and to identify comparative best practices at any given time (Brusoni *et al*. (2001), Yang *et al*. (2010)). How well these idiosyncratic elements are identified, configured and made to interact will help determine the ultimate efficiency of the training system.

Technical co-operation between donors and local partners – taking the form of donor-provided material, equipment and services, and capacity development of a given partner – has been said by several commentators to be unsuccessful in building and strengthening local capacities (Berg (1993: 244), Kraak *et al*. (2016)), and that it even has a tendency to "displace or inhibit local alternatives" (Fukuda-Parr *et al*., 2002: 4-5). Donors have to some extent learned their lesson and are now refocusing their "knowledge aid" to help develop institutional and regulatory environments and policy. The other kind of "knowledge aid," that of fortifying productive capacities, still takes somewhat of a backseat: Bell (2007: 10-11) describes this aid as "limited" and sometimes only present in activities such as project-embedded technical assistance. In terms of where donor support (or for that matter government support) could be best targeted, it appears to be prudent (given experiences in similar circumstances (as described, for example, by Hausmann *et al*. (2005:14)) to support competent entrants or training leaders, especially if they are generating skills-supportive spillovers for emulators.

The effect of a spillover depends on the scale, "fit" (in terms of needs and absorptive capabilities), and the structure in place to organise this transfer either through managed or unmanaged means, in the sense that, for example, a formal relationship exists to effect the spillover or a random spillover occurs in an accidental way. A training/skills spillover can be facilitated by informal networks that can operate reasonably efficiently over short distances but would be diluted, disconnected or even contaminated should the distance be too great. A formal network would be more likely to pass it on intact and clear over longer distances and possibly to more targeted destinations.

There are at least two other factors relevant to this particular aspect of training/skills spillover: the effect is greater if the receiving organisations actually have a specific or complementary need for this input and if they operate in a related field. Naturally, the lack of complexity and specificity,

and the adaptability of the knowledge involved are central considerations in this topic.

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VOLUME ONE
STEPHEN MURRAY KIERNAN

Lecturas del Centenario de la
Academia Nacional de
Historia y Geografía/UNAM
1925-2025
Lectura No. 89
100 ejemplares
Junio, 2025
México