CBQ-Project Report

Summary and Conclusions of Data Analysis

based on company cases analysed using the online measurement instrument

„Cost-Benefit-Quality (CBQ)".

Ursel Hauschildt

Imprint

CBQ-Project Report: Summary and conclusions of data analysis based on company cases analysed using the online measurement instrument „Cost-Benefit-Quality (CBQ)". This project report summarises the results of a comprehensive data analysis of the costs, benefits and quality of in-company training provided in a total of 142 South African companies who participated in the project "CBQ South Africa (2012 – 2015)." This project was initiated and supported by the manufacturing, engineering and related services sector education training authority (merSETA), Johannesburg, South Africa

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Plausibility checks of company cases and training of CBQ administrators
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„Cost-Benefit-Quality (CBQ)"

Ursel Hauschildt

Bremen, 16.06.2016

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Section 1: Project background

Apprenticeship or technical and vocational education and training can be regarded as the backbone of a competitive economy. In recent years, initiatives in TVET policy making have internationally been characterised by a renewed interest in concepts known as 'dual VET' or 'apprenticeship', not least of which because the benefits of well-functioning dual VET or apprenticeship systems have become increasingly evident: Countries with an established apprenticeship or dual VET system seemed to have a comparative advantage and have coped better in times of economic breakdowns. Moreover one has observed that problems of skill shortages on the one hand and youth unemployment on the other were less significant in countries with an established apprenticeship system where employers contributed to providing considerable in-company training opportunities.

However, vocational education and training can only develop its full potential as a contributing factor for economic growth and an essential component of the educational system if its core element, namely in-company training as its practical part is both cost-effective and of high quality. For any employer the question of whether to train apprentices or to employ personnel trained somewhere else depends on the decision which alternative could be the most efficient way to secure or to meet the company's demand for well-trained staff.

Although economic efficiency is always one of the major driving forces behind entrepreneurial decisions only a very few companies manage to set up a precise cost-benefit calculation for training provided within their own company, and cost issues are often overestimated. This lack of accurate information and transparency was one of the main arguments to set up CBQ (CBQ= costs, benefits, quality) as an online measurement instrument, especially designed for companies/company managers to be able to measure the costs, benefits and quality of in-company training based on a self-evaluation approach.

The first steps of the project were taken in 2006 by Bremen University's TVET Research Group (I:BB). Since then, the instrument has been successfully applied in various regions and sectors in Germany and South Africa.

For the South African context, the method has been modified and adopted to country-specific conditions before it was applied in an initial pilot test in 2011/12. During the course of the years 2013 to 2015, and based on the experiences of the South African pilot project CBQ has been introduced on a larger scale within the frame of the project „Implementing modern VET tools in South Africa" which was supported by the merSETA, Johannesburg, and realised in close cooperation with the University of Bremen.

Apart from the project's main, general aim to provide an easy-to-use "VET controlling system" for employers, it was also intended to collect a solid database from which the accumulated results can be utilised for further comparative analysis in different economic sectors and regions. Likewise a CBQ single user not only receives an individual analysis of the costs, benefits, and quality of their in-company training but also gets benchmark figures based on the cumulative results from companies operating in the same economic sector or providing training opportunities in a similar or related profession.

A third motivation for the project was the creation of an instrument for consultant use, which can be used by chambers of commerce, SETAs or other VET advisory bodies in the longer term.

The following box summarises the specific project aims of CBQ in the South African context:

<table>
<tr>
<td rowspan="3">For the employer:
- To understand the training costs related to candidates entering an apprenticeship with different pre-apprenticeship qualifications[1]. The preparation towards entering an apprenticeship depends on curriculum content and simulated practical exposure.
- To assist in comparing CBQ information between two different employers/ companies training apprentices in the same trade.
- To understand the difference in costs between training apprentices in a single trade across different industrial sectors.
- To interpret possibilities for improving the productivity of apprentices.

For the learner:
- To determine which pre-apprenticeship programs offer the best preparation for favourable consideration by an employer when selecting apprentices.
- To guide apprentices on expectations towards their productive contributions to work process during the different stages of apprenticeship</td>
<td>For the public TVET (Technical Vocational Education and Training) Colleges:
- To assist in the information sharing that builds the relationship between the TVET colleges and other stakeholders within the ecosystem.
- To assist with qualitative information that will promote their candidates to find employment after their apprenticeships.
- To inform about best pre-apprenticeship qualifications and apprenticeship preparation activities.
- To assist in benchmarking their curricula against those of private training providers[2]</td>
</tr>
<tr>
<td>For the private training provider:-
- To assist in setting training fees according to current market rates.
- To use the CBQ as a consulting tool that builds a service offering for employers.
- To examine the possibilities of tailoring curriculum offerings to specific employer needs.</td>
</tr>
<tr>
<td>For accredited Decentralised Trade Testing Centres:-
- To link first time trade test pass rates to CBQ data and share this information with apprentice training stakeholders.</td>
</tr>
<tr>
<td colspan="2">For the merSETA:
To utilise CBQ information/data to encourage an increased interest in training apprentices.
- To determine discretionary grant values based on the comparative costs of each different trade.
- To utilise CBQ data to determine allocation of funding towards trades to promote scarce and critical skills.</td>
</tr>
</table>

Box 1: Anticipated benefits of CBQ in South Africa (see Brown, H. / Hauschildt, U. (2011)

An examination of training costs and benefits cannot be done without a consideration of the corresponding quality factors because – contrary to other domains – an investment in *educational* quality does not necessarily lead to higher costs but, in fact, has the potential to reduce them in the long run. Good or excellent quality will always be a given, if a company with its own training personnel manages to shape learning in a manner that allows for a direct involvement of learners in qualifying working processes.

In entrepreneurial action costs should never exceed benefits – and if they do, an examination of the contributing factors (or quality reasons) and getting more knowledge on how to shift the balance towards a more favourable result is among will be among the most important

[1] School leaving certificates include a Matric (Grade 12) with maths and science; Senior Certificate (Technical) and courses at Further Education Training College certificates such as National Certificate Vocational levels 2 – 4; National Technical Certificate (Nated) levels 1 – 6.
[2] Private training providers may also be accredited in-company training centres.

issues any manager needs to address. Providing such individual analysis and information is a core element of the CBQ initiative. So, even though the measurement instrument is initially responding to the monetary interest of companies, individual users get feedback on the inter-relation between the cost-benefit ratio and the quality of training provided in their company.

Nevertheless, the present report does not focus very much on such individual company profiles and will not take individual cases in order to exemplify a general situation. This summarising analysis looks at the aggregated data in order to derive conclusions, which may very well be of general relevance.

Over the course of the last three years more than 200 individual company cases have been examined including training opportunities in more than 20 professions. Companies that took part in the survey have been small or medium sized firms with only a limited number of apprentices or larger ones offering training opportunities for more than a hundred learners in different vocational fields. They were linked to the chambers of auto, motor, metal or new tyre and were mostly associated to the DTTC as the institution monitoring the final exam.

All in all, the project was accompanied by a series of employer workshops in South Africa, most of them in Johannesburg, Port Elizabeth and East London as well as a number of further training workshops in Germany. In order to guarantee a high quality of data entry, CBQ administrators were trained in supporting workshops at the University of Bremen, where plausibility checks of the data were provided and questions on individual company cases were addressed.

Within the frame of the project, three manuals on CBQ have been elaborated to support users and administrators and to offer background information on cases of best practise that serve as supplementary information to the present project report.

Section 2: Data structure

All in all the online instrument has been applied to 202 company cases, 142 of which have been cross-checked by the merSETA in cooperation with the IBB during training seminars at the University of Bremen. In 46 cases, data entry had not yet been completed when this report was written. In some further 14 cases, data entry had been completed, but had not yet been validated for benchmark purposes, when the analysis of this project report was started on the basis of the existing cases (completed by Jan 2016). All analysis where such validation for benchmarking was a precondition is thus referring to a total of 142 cases.

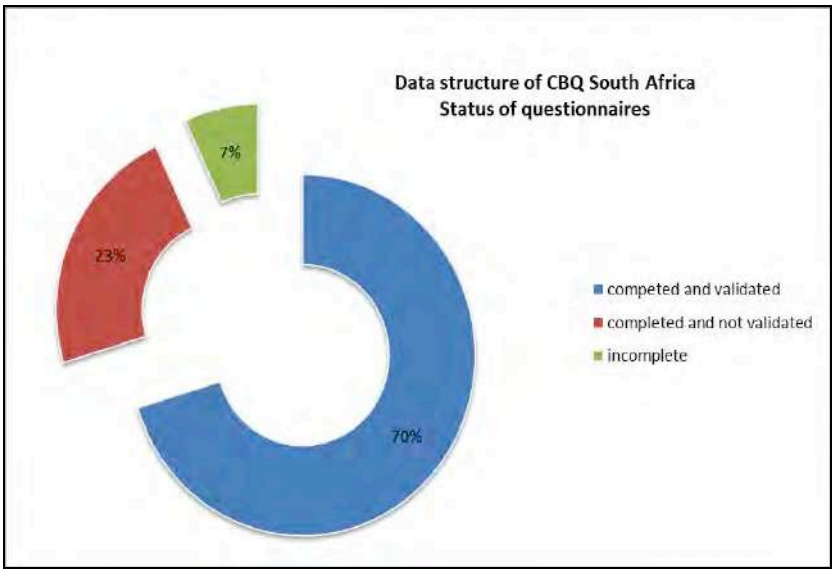


Figure 1: Data structure of CBQ – South Africa 3/2016

The biggest share of CBQ users were company managers (75%) followed by full-time trainers (12%), then foremen or supervisors (9%). Some data entry was done during the CBQ introductory workshops in South Africa hosted by the merSETA or ecsecc. Most of the data sets were generated in co-operation with the merSETA, either supervised by local personnel or by external facilitators, who supported the project team during the final phase of the project.

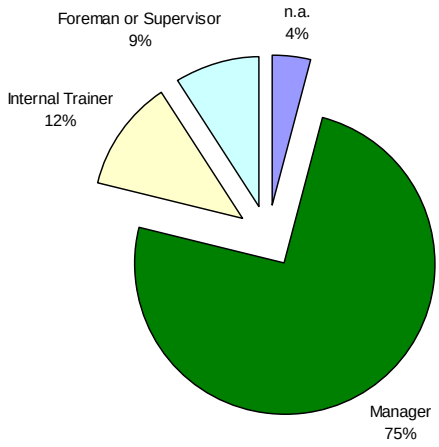


Figure 2: CBQ South Africa: persons responsible for data entry

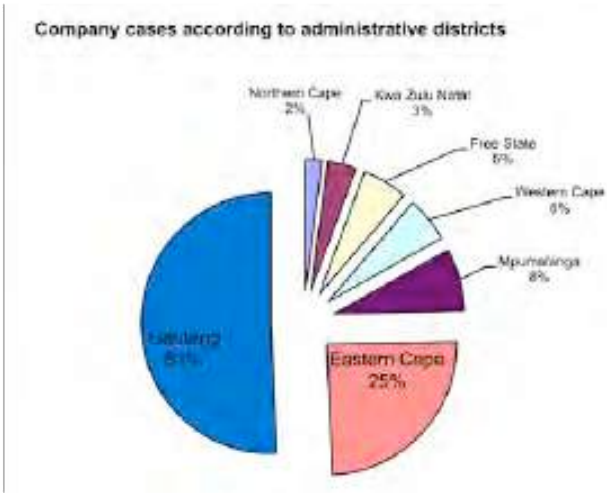


Figure 3: CBQ South Africa: cases according to administrative districts

The 142 individual CBQ cases represent a variety of vocations trained in different company environments. The present analysis is thus able to refer to data on in-company training that was gathered in micro, small, medium and large enterprises including some multinationals. Some companies inserted more than one data record, i.e. when different vocations were trained in the same company. Figure 4 provides an overview on the South African company cases according to company size, here defined by the number of employees.

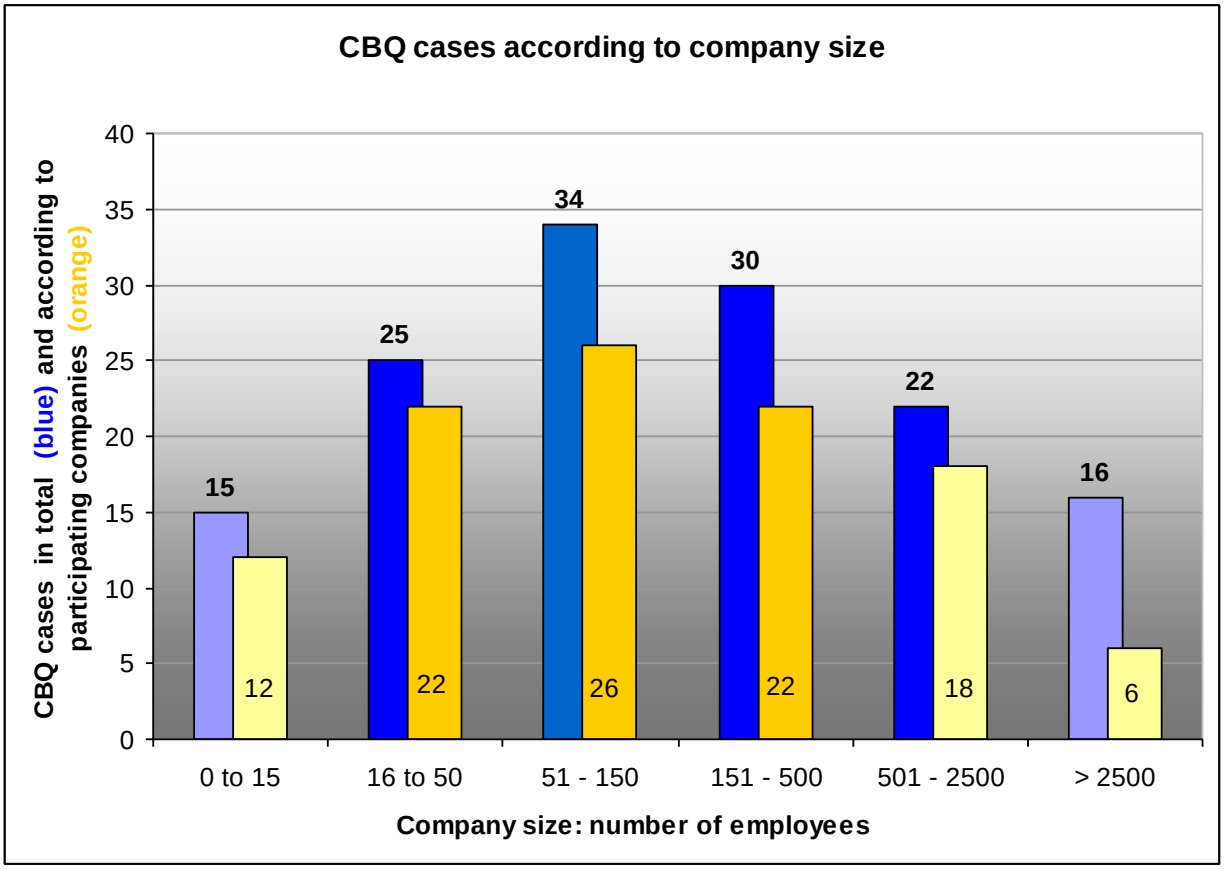


Figure 4: CBQ South Africa: cases according to company size (number of employees)

Among the vocations trained, the largest groups were those of fitters, turners or fitters and turners with a total of 28 cases, motor mechanics (n=17) and boilermakers (n=16). In the majority the professions trained referred to the chamber of metal (47%) and motor (27%), followed by the chambers of auto (17%) and new tyre (5%).

Most data sets describe courses of training with duration of three years (n=66) or four years (n=60). Only 16 cases were of a rather short duration of two years. In this report, an analysis is often made on the basis of averages but also making a distinction between 3-year and 4-year courses of training, whereas 2-year training opportunities are not looked at in more depth. Figure 5 lists all validated cases according to the different vocations trained, Figures 6 and 7 provide some information on the chambers of occupation and the institutions monitoring the final exams.

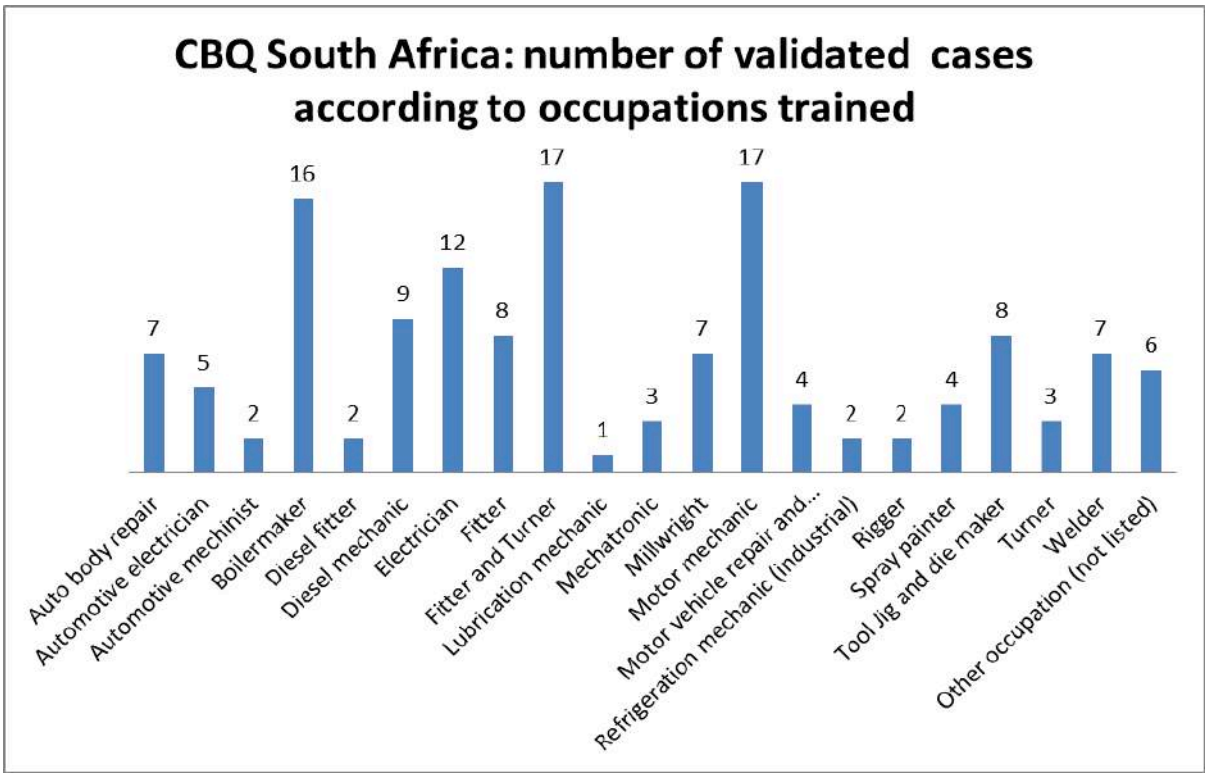


Figure 5: CBQ South Africa: Cases according to vocations trained

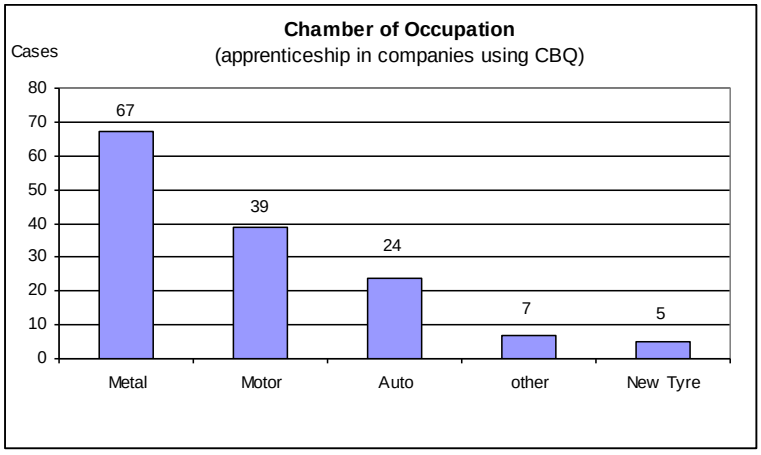


Figure 6: CBQ South Africa: Cases according to chambers of occupation

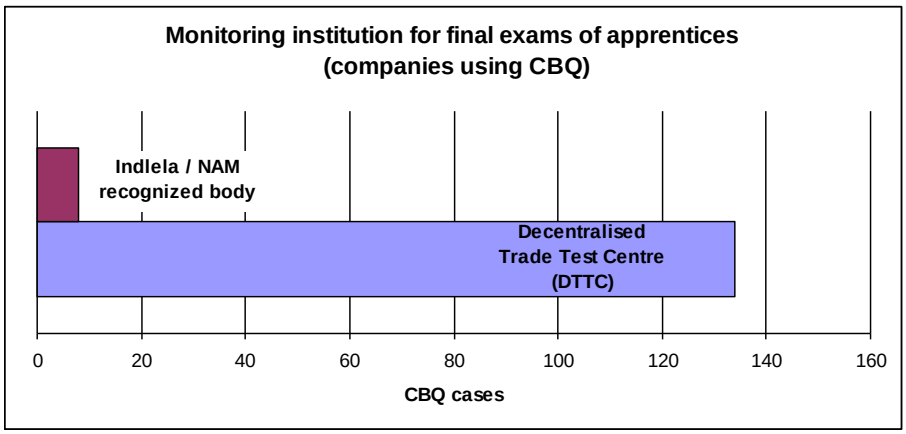


Figure 7: CBQ South Africa: Cases according to the institutions monitoring the final exams

The most common entry qualification of learners in companies using CBQ was a technical grade 12 with math and science, followed by NTC 3 +4 and NQF levels 2 to 4 (see Figure 8).

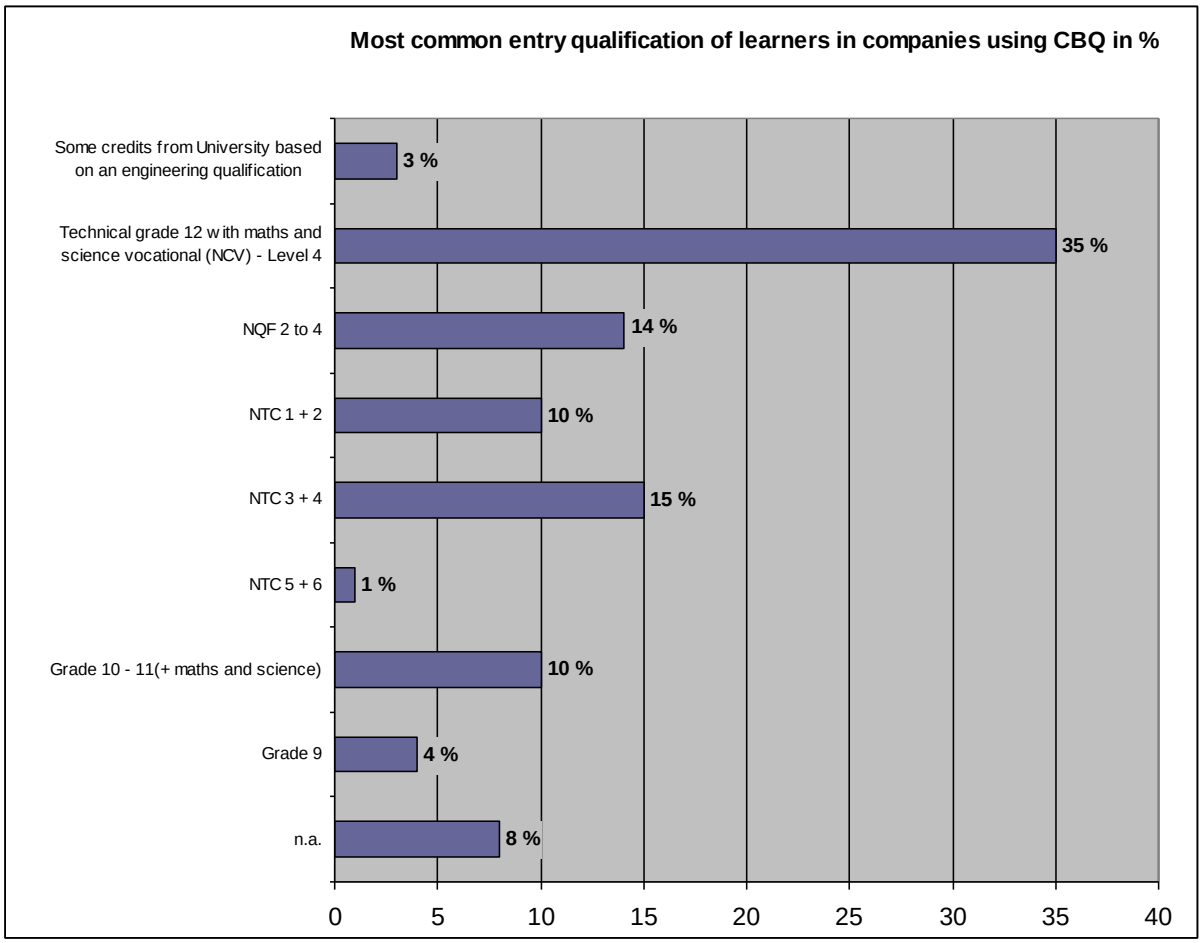


Figure 8: CBQ South Africa: most common entry qualifications of learners

Section 3: Analysis of costs and benefits of in-company training

3.1 Some principles

Costs of training

CBQ records the gross costs of the training and compares them with the value generated by the productive work of the learners during their training period. The costs of training are linked to three different main categories, which are wages/staff costs (for trainers and trainees), operational costs or write-downs (write-offs) and other costs as summarised in Table 1.

Cost components in in-company training	...for example:
1. Wages /Staff costs	• Staff cost of trainees (Training allowances) • Staff costs of trainers – Wages of full-time trainers – Wages of part-time/side-line trainers
2. Operational costs and write downs	Write-downs (write-offs) for machinery/equipment explicitly purchased for teaching and training purposes, fees for leasing, rents, etc.
3. Other costs	• Teaching and learning material • Fees for exams; fees to be paid to the appropriate body • Professional and protective clothing • External training courses, seminars • Training management or administration • Insurances • Travel and accommodation • (...)

Table 1: Cost factors analysed with CBQ

Costs of training can vary a lot and are linked to the specific training environments or traditions. Some bigger companies run their own training workshops and employ a number of full-time trainers, who do the preliminary training of apprentices and take over some administrative work associated with the training of learners. Other companies spend some money on external training, invite external trainers or send their learners to special training courses.

Training costs also vary according to the different requirements of training in different occupations. Whereas training of administrative clerks of forwarding agents might involve learning material such as software or school books, education and training in many technical occupations require additional material such as protective clothes and their cleaning, special insurance or expensive material or additional machinery and equipment.

Benefits

The training benefit is generated by the productive work of the apprentices. This benefit is equal to the wages that the company would have to pay to skilled workers if it did not employ apprentices.

An essential assumption for the calculation of benefits is that apprentices work and contribute productively to a company's business. Their level of productivity is a crucial indicator for the determination of benefits. In order to receive detailed feedback on the benefits of in-company training provided in their companies, CBQ collects information on the average wages of fully trained or fully skilled workers who have been trained and examined in a specific profession. These wages are considered to be equal to the wages learners will receive after a successful finalisation of apprenticeship.

As a point of reference for the degree of productivity CBQ looks at an average productivity of a fully skilled worker, whose degree of productivity can be regarded as 100%. If an apprentice needs twice the amount of time a skilled worker needs for a particular work task, then the apprentice's productivity would be 50%. If an apprentice cannot solve work tasks on his or her own, but contributes to it to a limited extent, this contribution can be recognised as his or her productivity.

During a three or four year course of training, an apprentice should reach or at least come close to a degree of 100% productivity – a development from novice to expert as demonstrated in Figure 9.

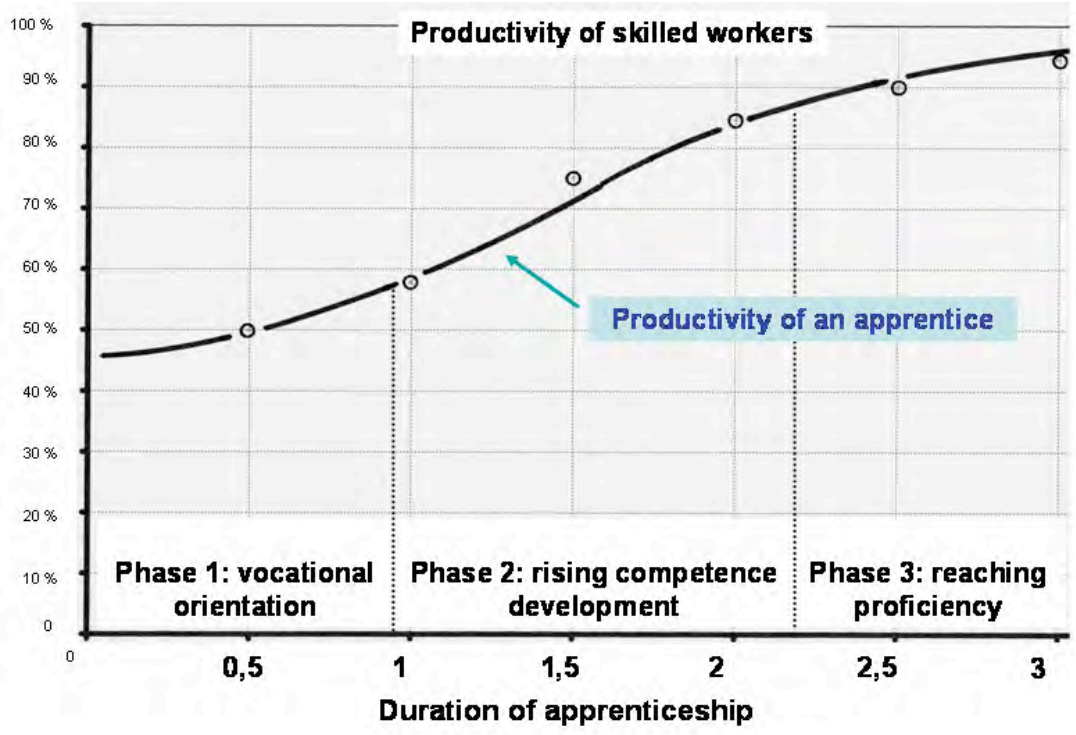


Figure 9: Development of a learners' productivity during apprenticeship

Further benefits:

As CBQ is based on a production-oriented and not an investment-oriented approach to training, some other types of benefit are not measured with the help of the instrument. These can be called additional 'opportunity benefits', which occur when a company invests in training its own personnel, so that recruitment costs for staff entering the company as fully trained personnel can be saved: a company providing training does not need to invest in job advertisements or assessment centres and the like, provided that former trainees stay with the company as skilled workers in the longer term. (For a detailed description of additional benefits associated with in-company training, see Cramer/Müller 1994 and Walden/Herget 2002).

Training at different places of learning

Apprentices can only be productive if they are contributing to real work orders or if the job that they are working on in a training workshop is related to job orders that are part of a company's business processes. CBQ considers in detail all training periods where apprentices are not actively contributing to the business process due to regular leave and training periods, or those that are theoretical or take place outside the company. Moreover, it analyses in detail which percentage of workplace-based learning was on a skilled workers' level (or at a level of unskilled or semi-skilled worker, respectively). In the sample case below, 76% of apprentice training is at the company, out of which about 23,75 % is at a lower skilled level.

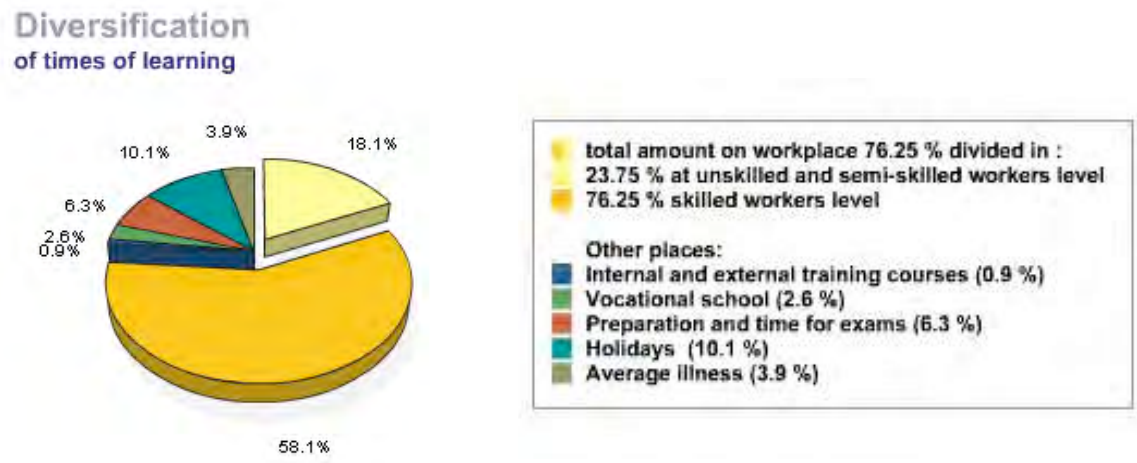


Figure 10: Diversification of learning times

Subsidies

The South African version of the CBQ instrument also includes a separate consideration of subsidy payments, SARS or mandatory grants. These are explicitly documented in the feedback forms to the users so as to provide realistic feedback about how much a company depends on public support for apprentice training. Figure 11 is an extract for a sample feedback form, where subsidies are included in the cost-benefit balance. In the present case, the company's cost-benefit balance would be negative it did not receive support.

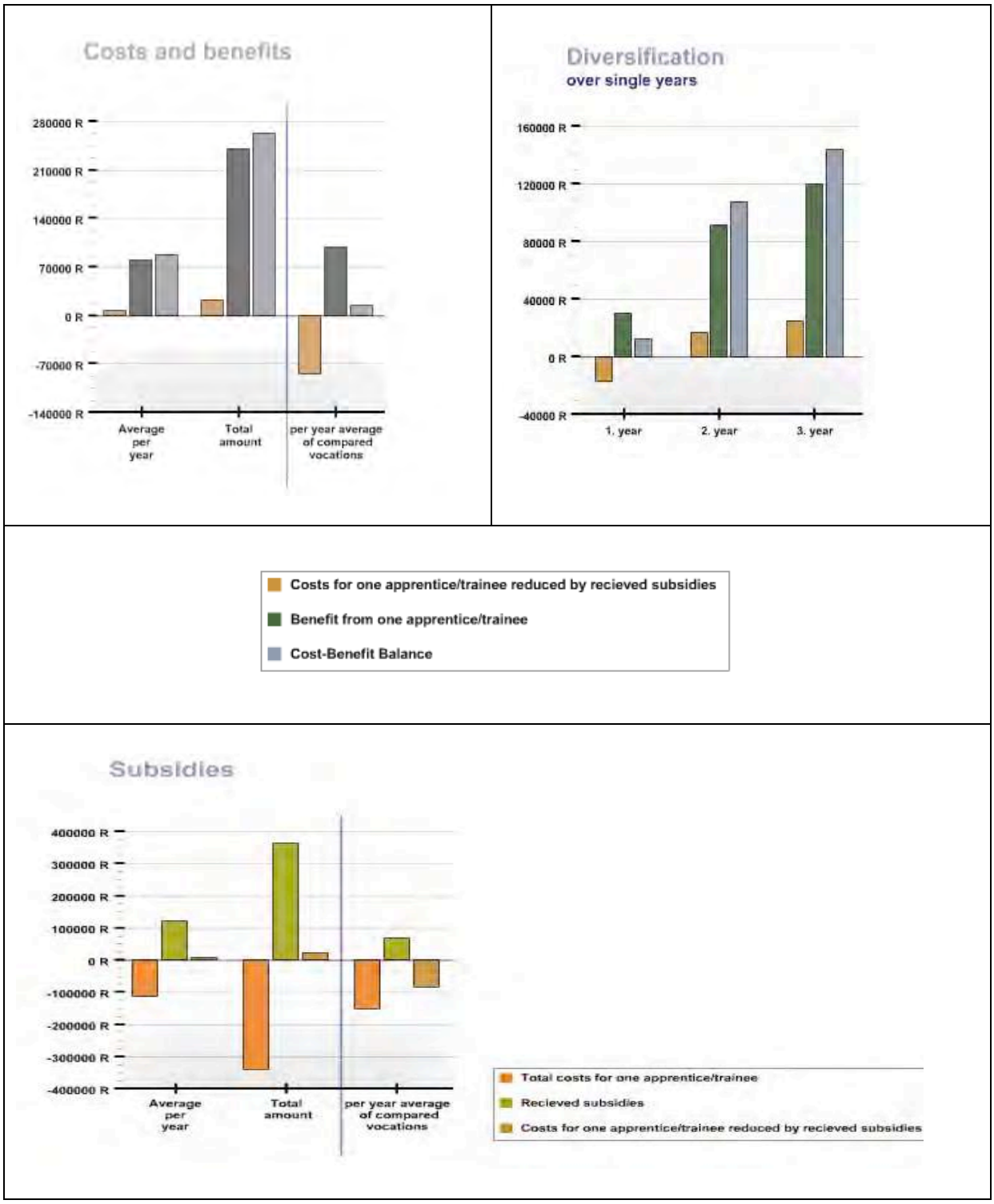


Figure 11: CBQ cost-benefit balance in a sample company – including a documentation of subsidies

3.2 Results

This section provides an overview of the average costs of in-company training provided in the companies that participated in the survey. At first, an overall result of the cost-benefit balance will be given, including a consideration of subsidy payments to the companies. All major cost determinants will be analysed subsequently.

3.2.1 The Cost–Benefit Balance

On average, companies had total cost of about 316.500 ZAR per apprentice trained. This average value consists of all courses analysed, i.e. they include 2 year training, as well as a course with a duration of three or four years. The average value of the corresponding benefit in all cases is about 319,200 ZAR, the average cost-benefit balance almost being at equilibrium with a small average net benefit of about 2,800 ZAR over an entire training period.

If one looks separately at the average results of training courses with a duration of 3 or 4 years, it is striking that in the area of 3 year courses of training, there is a net loss of about 40,000 ZAR, whereas in a course of 4 years, the average result is a net benefit of about 100,000 ZAR (for detailed figures, see Figure 12). However, all these average benefits include subsidy payments, which reduce the net costs of training, sometimes considerably (see Table 4).

Therefore, it is necessary to analyse the cost-benefit ratio as if subsidy payment were not provided in order to receive a more realistic picture of the actual costs that occur in companies providing in-company training. In this calculation it becomes evident, that – on average – neither 3-year courses, nor 4-year courses of training manage to reach net benefits or come close to an equilibrium between costs and benefits without the support of SARS or mandatory grants (see Figure 12b).

Table 2 lists the specific amounts of subsidies as average values and according to the three different types of training duration. Here it is striking that in those cases where training was only based on a 2-year period, subsidy payments were higher than in courses with a longer duration. Provided that all data entry in this area was accurate, it has to be asked why learnerships or apprenticeships with a relatively short duration are supported to such an extent.

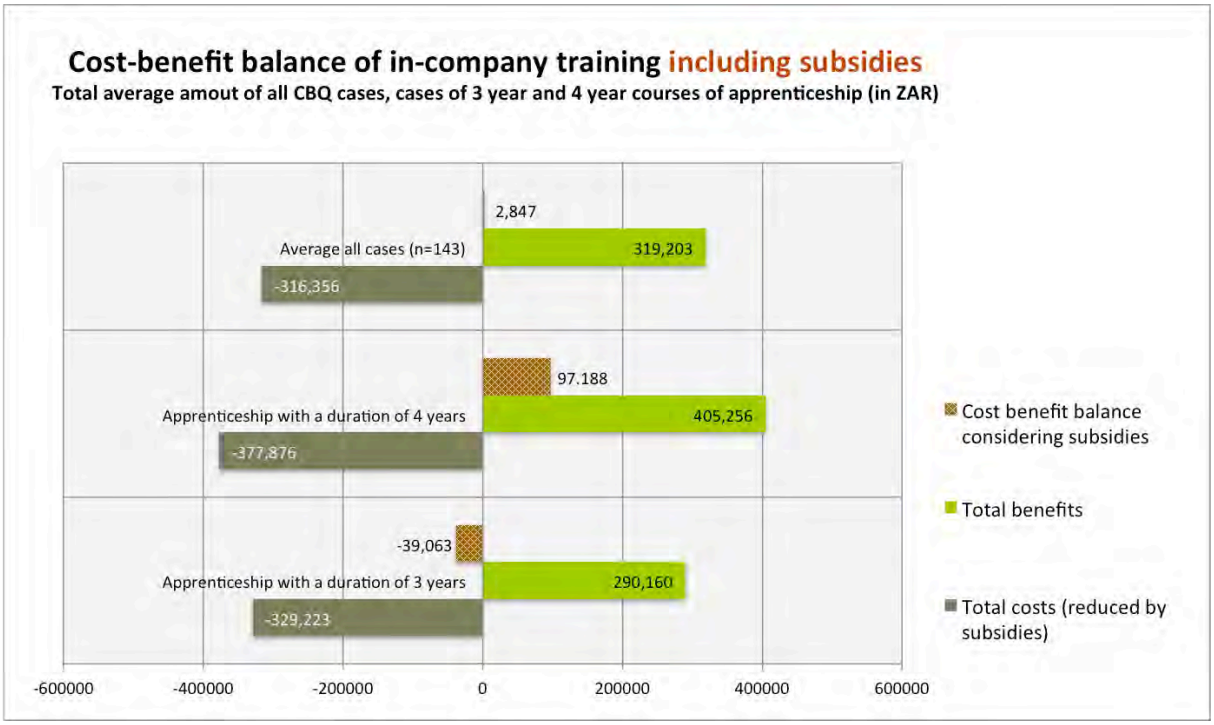


Figure 12a: CBQ South Africa: Cost-benefit balance of in-company training. Calculations include total amounts of subsidies provided. Average results of all cases and referring to the entire period of training in contrast with the average total results of courses with a duration of 3 and 4 years.

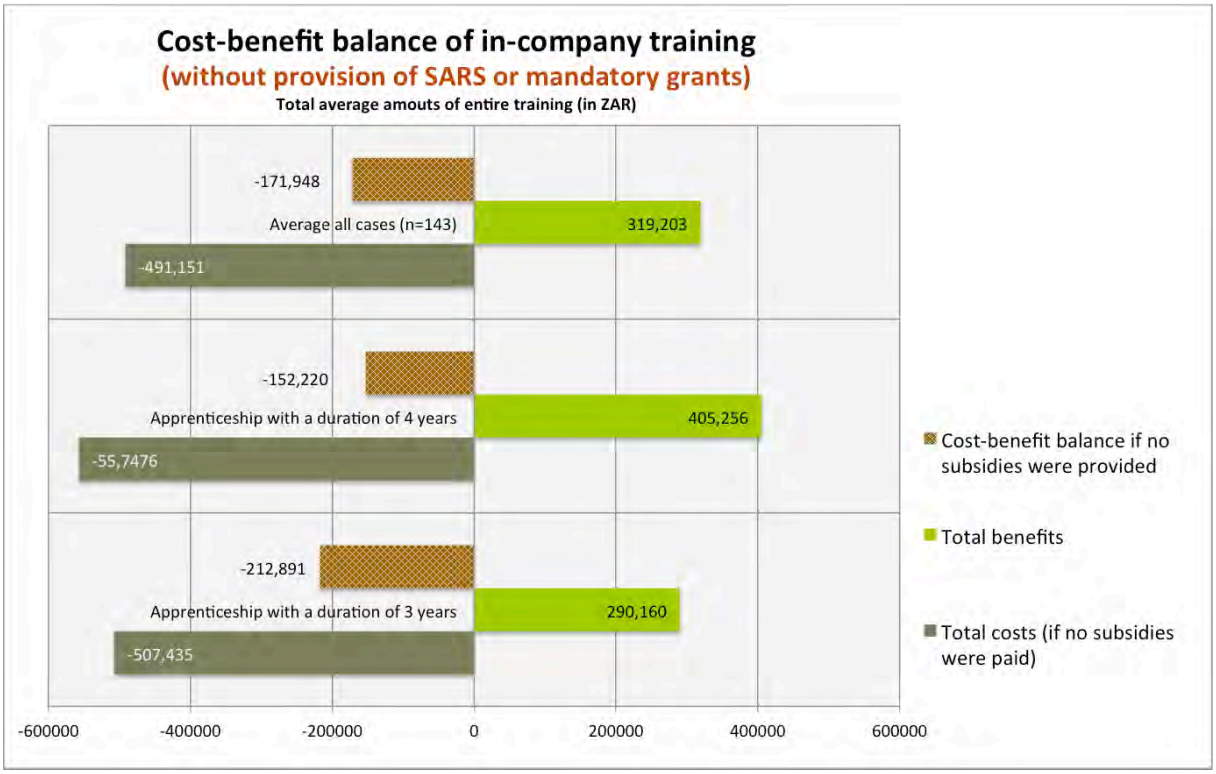


Figure 12b: CBQ South Africa: Cost-benefit balance of in-company training. Calculations based on subsidies having been reduced to 0. Average results of all cases for the entire period of training, in contrast with the average total results of courses with a duration of 3 and 4 years.

Subsidies

Average support per year	ALL (n=142)	2 year course (n=16)	3 year course (n=66)	4 year course (n=60)
Total average amount of subsidies per apprentice	20,193 ZAR	40,535 ZAR	22,477 ZAR	12,254 ZAR
Total average amount SARS tax allowance (per apprentice)	12,475 ZAR	19,706 ZAR	12,200 ZAR	10,50 ZAR
Total average amount of mandatory grants	18,894 ZAR	17,707 ZAR	24,727 ZAR	22,796 ZAR
SUM	**51,562 ZAR**	**77,948 ZAR**	**59,404 ZAR**	**44,900 ZAR**

Table 4: CBQ South Africa: Overview of average subsidies paid for the different types of training course

When discussing the overall results of Figures 11 and 12, however, it has to be emphasized that both of these graphs represent average performances. There are many cases that differ greatly from these averages; i.e., there are a good number of cases where no grants were provided and benefits still exceeded the costs of training. Such cases are listed in the manual of best practices elaborated within the framework of the project (CBQ Manual III – Cases of good and best practice. IBB/merSETA. Bremen/Johannesburg).

3.2.2 Cost factors of in-company training

As for the major contributors to the costs of training, training allowances and trainer wages play the most important role (see Table 11). Their share of the costs is about 50-60% (training allowances) and 20-30% (staff cost for training personnel), which shows quite clearly that these are by far the most important cost factors in all training opportunities, regardless of duration, although there are some interesting differences which will be looked at in more detail later.

Training allowances and wages

Training allowances in all cases analysed started with an annual average amount of about 63,300 ZAR in the first year of training. This amount rose to 72,700 ZAR in the second year, and to 92,500 ZAR in the third and fourth years of training; i.e. on average there are no great differences in the amounts of training allowances paid for learners in a third or fourth year (for detailed results in ZAR see Figure. 13).

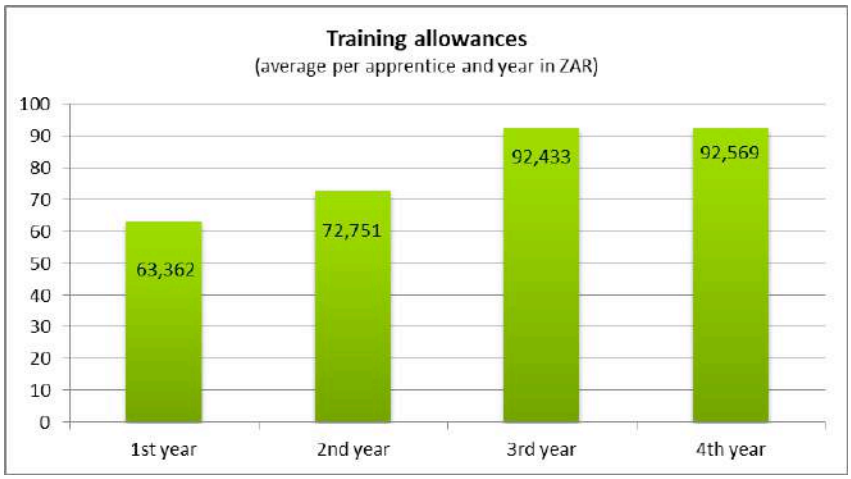


Figure 13: CBQ South Africa: Training allowances for apprentices in different years of training (142 cases, consisting of different groups: 1st and 2nd year: n=142, 3rd year: n=126, 4th year: n=60)

Nonetheless there are very great differences between the actual amounts paid for learners' allowances; therefore, it is worth looking at the respective extreme values that were entered into the CBQ database and proved as valid (Figure 14). Here, it becomes evident that some learners receive more than four times the amount of compensation during their training than their colleagues. This applies to learners in the same occupation, who are trained in different company environments.

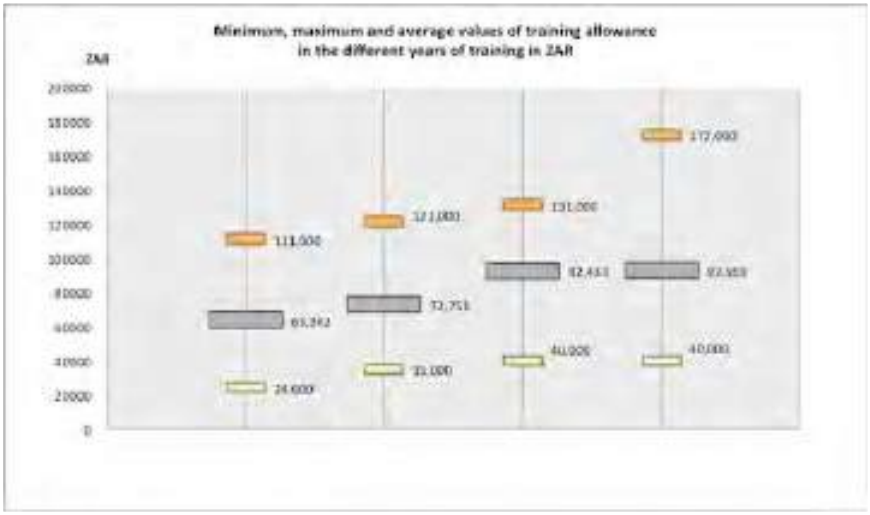
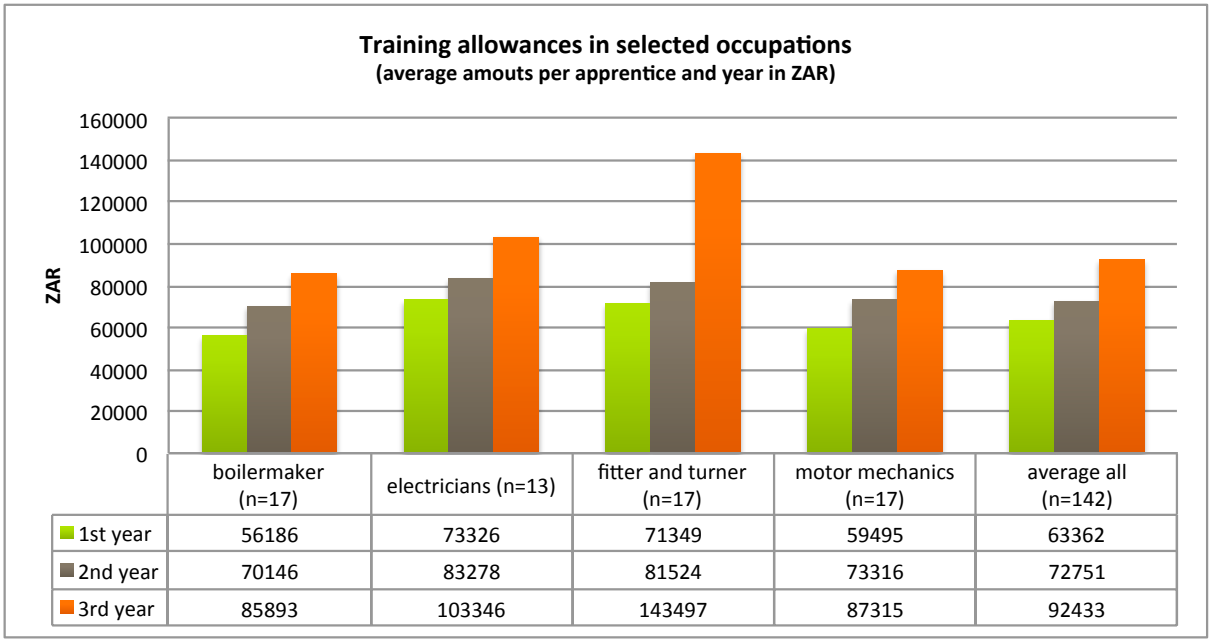


Figure 14: CBQ South Africa: Training allowances in the different years of training. Min and max amounts in ZAR and calculated averages (142 cases, consisting of different groups: 1st and 2nd year: n=142, 3rd year: n=126, 4th year: n=60)

When it comes to an analysis by vocations trained, there were some differences between these groups of learners. Where the database consisted of a sufficient number of cases that allowed for a group analysis, the calculations of average results obtained by vocations were made. Figure 15 sums up the development of training allowances in four selected occupations in a 3-year course of training, per apprentice and per year. In this comparison, it is striking that electricians, fitters and turners receive higher training allowances than do boilermakers or motor mechanics. The highest results were obtained by fitters and turners in their final year of training. However it remains to be verified whether this value reflects the reality, since 17 cases are still not enough to derive general conclusions.



	boilermaker (n=17)	electricians (n=13)	fitter and turner (n=17)	motor mechanics (n=17)	average all (n=142)
1st year	56186	73326	71349	59495	63362
2nd year	70146	83278	81524	73316	72751
3rd year	85893	103346	143497	87315	92433

Figure 15: CBQ South Africa: Training allowances on average per apprentice and year of training in selected occupations compared to compared to averages in their fields /vocations

Wages of trainers

In 41 out of 142 companies which were analysed, full-time trainers were employed. Among these cases the majority, i.e. 34 companies, also employed part-time trainers. Only 7 cases were listed where only full-time trainers were responsible for the teaching and training of the learners. Wages of full-time trainers are often up to 100% training costs, whereas wages of internal part-time trainers play a minor role in training costs, as their preliminary activity relates to real work processes and is not solely dedicated to teaching.

1n 135 cases, part-time trainers were involved in the training of apprentices. These were fully skilled workers as well as engineers, foremen and team leaders. As for the numbers of internal part-time trainers engaged in in-company training within a firm, these differed greatly, ranking from one to more than 100 persons, related to the respective company sizes and number of learners. The following two tables provide an overview of the distribution of company cases, including company sizes and numbers, categories of trainers, and their costs (wages).

The figures documented in Tables 5 and 6 seem to be very plausible, reflecting reality to a high degree, however there are still some cases where the data entry might not be correct or – if it was correct, training took place in a rather unusual way. For example, a company with 35 employees might, not employ a full-time trainer for a very small number of apprentices

because in doing so, training costs would far exceed benefits, given the fact that full-time training often implies that a trainer's productivity and contribution to real work processes is lower. In such cases, it might be necessary to re-examine the problem at hand in order to better understand how training is organised here. Another extreme would be if a company had indicated, that only one or two internal part-time trainers were engaged in the training process (Table 6), but the company size was very high (3500 employees) including a number of apprentices greater than 20. But apart from such 'borderline' cases the examination of the amount of trainers involved in the training processes a company offers was, for the most part, found to be plausible and relevant for further calculations and analysis.

Number of **full**-time trainers/training officers	1-2	3-5	5-10	11 - 20
CBQ Company cases	29	6	4	2
Company sizes	**35** to 9000	500 - 9000	2500 - 9000	3000, 9000

Table 5: CBQ South Africa: Company cases with an employment of full-time trainers

Number of internal **part-time** trainers:	1-2	3-5	6-10	11-30	50 - 110
CBQ Company cases	50	41	20	21	3
Company sizes	4 - **3500**	9 - 1300	50 - 9000	300 - 3000	1000 - 9000

Table 6: CBQ South Africa: Company cases with an employment of internal part-time trainers

With regard to the actual amounts of wages considered in the calculation of training costs, these have been analysed and are documented in the following table. Full-time trainers receive average wages of about 270,000 Rand per year, while the actual wage range was between 12,000 and 58,000 ZAR per year. Such great differences between the actual wages paid for internal part-time trainers also exist. As for skilled workers in a given profession or for engineers, these wage ranges were even greater, ranking between 78,000 to 540,000 ZAR for skilled workers or from 234,000 to 750,000 ZAR for engineers.

CBQ calculates in detail how much of the amount of wages paid for the personnel involved in training processes has to be dedicated to the costs of apprenticeship training in each specific company case. If engineers are involved as part-time trainers, this is often only to a very limited extent or amount of time. The same applies to all other part-time trainers who often only spend a few minutes per day giving instructions or providing help if a learner asks for advice. In order to receive an estimate of the average amount of time part-time trainers spend on training processes, the data analysis of all CBQ cases suggests an average share of about 14.1 % of their total working hours so that 14.1% of the wages companies pay for internal trainers have to be considered as training costs. It goes without saying, that this is a very rough figure that sums up the engagement of *all* types of internal part-time trainers and might be lower for engineers and higher for skilled workers in real life in any given individual company.

Figure 16 provides an overview of how trainers' wages contribute to a company's training costs on average. This overview indicates that full-time training personnel is engaged up to 100% in training which – for example – takes place in workshop trainings that do not contribute to a company's business. This is a reality in many companies analysed in this study but it has to be added, that – in individual cases – the percentage of full-time trainers' wages that can be attributed to the costs of in-company training is lower than 100%, provided that a full-time trainer spends time on real job orders, i.e. on value-added processes. An analysis in this

regard can be derived from the summary of cases selected as best practice cases of CBQ South Africa (CBQ Manual III – Cases of good and best practice. IBB/merSETA).

	Full-time trainers / training officer	Internal part-time trainers		
		Skilled workers	Foremen /team leaders	Engineers
Wage range according to CBQ data entries	120,000 ZAR to 580,000 ZAR per year	78,000 ZAR to 540,000 ZAR per Year	120,000 ZAR to 500,000 ZAR per Year	234,000 ZAR to,750.000 ZAR per year
Calculated average	**272,574 ZAR per year (n=115)**	**226,477 ZAR per year (n=693)**	**307,086 ZAR per year (n=188)**	**432,714 ZAR per year (n=28)**

Table 7: CBQ South Africa: Overview of wages to be paid for the different types of training personnel employed on a full-time or part-time basis

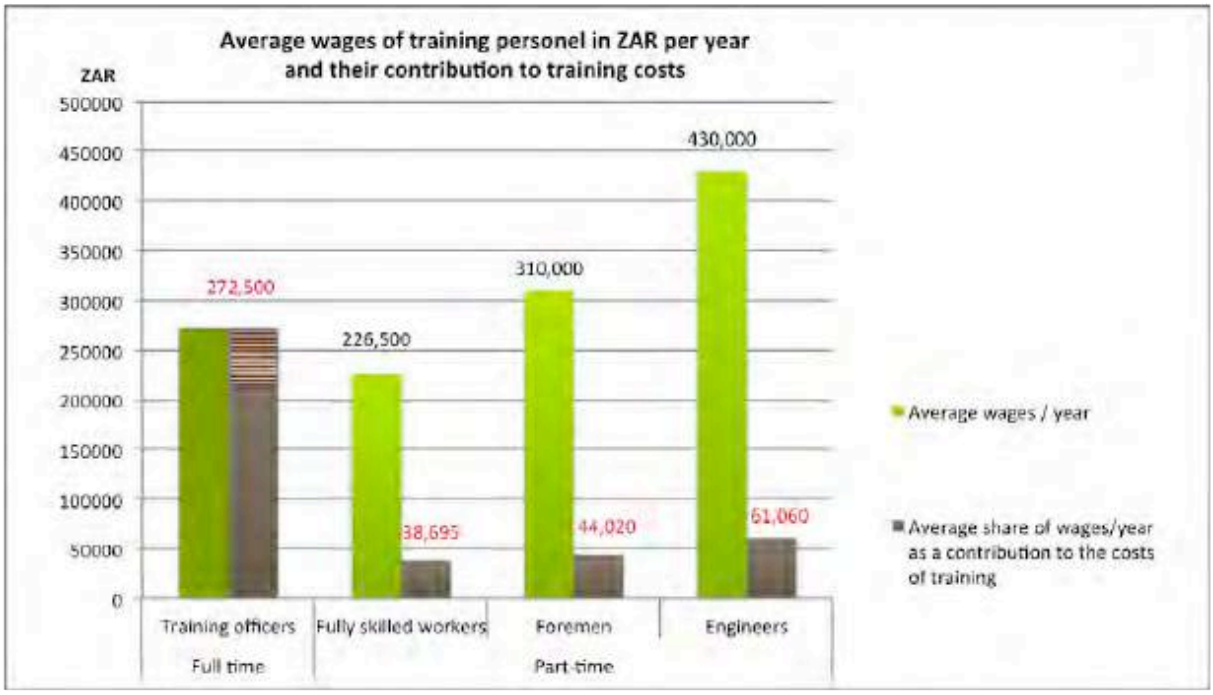


Figure 16: CBQ South Africa: Average wages of South African training personnel in ZAR per year and their average contribution to the total costs of training (average wages are rounded figures in this diagram. The exact values are listed in the above tables).

The benefits of apprenticeship training are – as they have to be derived from the actual work contributions of learner to a company's business process – measured in terms of the amount of wages a company would otherwise be paying for skilled personnel if there were no apprentices working on these particular job orders. Therefore, the difference between learner's allowances and the level of skilled workers' wages is a crucial factor to be looked at. Figure 17 summarises the average wages of full-time training officers and internal part-time trainers as well as learners' allowances in the different years of training. The crucial figure for a rough comparison is the average amount, which would be paid to fully trained workers.

In comparison to the wages paid to a fully skilled worker, learners receive an amount of 27.9% in the first year of training. In the second year of training, training allowances reach an amount of 32.1% of skilled workers' wages and in the third and fourth years, this percentage reaches a value of about 40.8% on average.

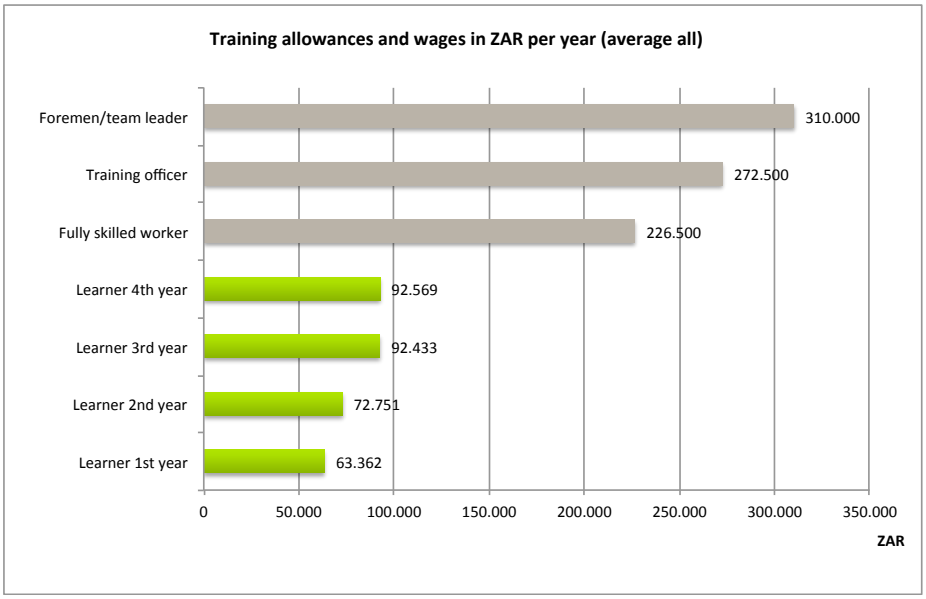


Figure 17: CBQ South Africa: Average training allowances compared to the wages of the training personnel in ZAR per year

In particular, the amounts paid in these final years of training seem to be relatively high when they reached values above average (Figure 14) – also compared to wage conventions in other countries, where training allowances do not exceed 35 – 40% of the amounts paid to skilled workers. If training allowances do not exceed such limits, training benefits could reach higher results, especially during the final years of training where the apprentice's productivity reaches a level closer to the one obtained by a skilled worker (Figure 18).

Figure 18 combines the information about average apprentice productivity (compared to a skilled worker) and training allowances paid to learners also in relation to a skilled worker's wage. The vertical bars in between these two lines represent the development of the potential for training benefits. These can only grow if there is an increase in the average apprentice's productivity or as a consequence of reduced average training allowances.

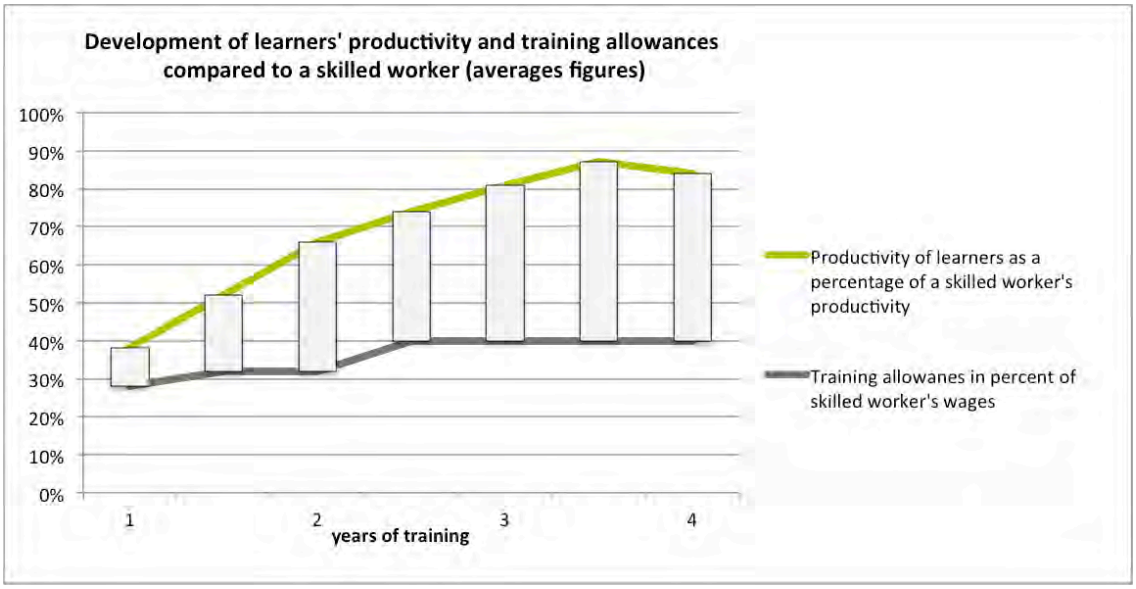
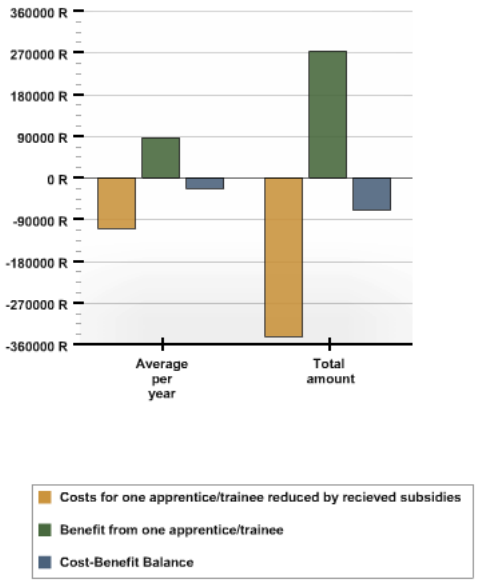


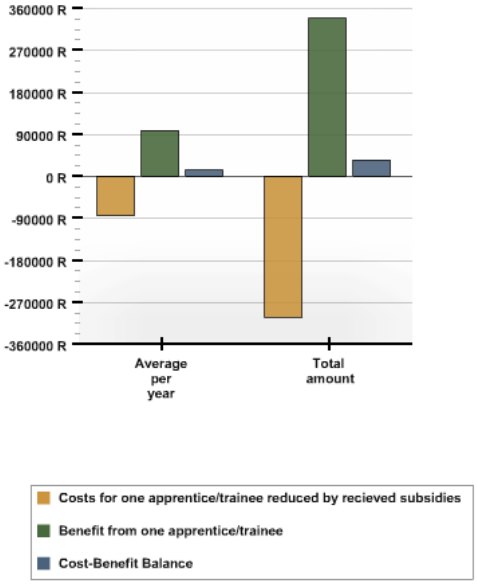
Figure 18: CBQ South Africa: Average training allowances as a percent of skilled workers' wages and theproductivity of learners as a percentage of a skilled worker's productivity in ZAR per year

Full-time trainers and the total costs of training

In order to illustrate the effect that the employment of full-time trainers often has on the total costs of in-company training, it is interesting to analyse all CBQ cases where full-time training officers are involved, and to compare these with all cases where only part-time trainers were involved. In the following graph this analysis has been summarised. Without considering the quality aspects of training and only with regard to its costs, one can derive the conclusion from this data that is seems rather difficult to reach a positive cost-benefit balance when engaging full-time trainers. On average, companies employing training officers were not reaching net benefits but were confronted with high costs of training, i.e. 22,887 ZAR per apprentice and year, while other employers who only engaged part-time trainers in in-company training were able to have a positive cost-benefit balance – in many cases even without subsidies or grants (see figure 19 for detailed amounts in ZAR).

Costs / benefits of in-company training and an employment of full-time trainers (FTT) (n=41)	..and based only on an engagement of part-time trainers (PTT) (n=102)





Costs and benefits: with FTT	Costs for one apprentice/trainee	Costs without subsidies	Benefit from one apprentice/trainee	Cost-Benefit Balance
Average per year	109240 R	175556 R	86353 R	-22887 R
Total amount of the costs for one apprentice/trainee over the whole training duration	342949 R	543966 R	272999 R	-69950 R

Costs and benefits: : without FTT	Costs for one apprentice/trainee	Costs without subsidies	Benefit from one apprentice/trainee	Cost-Benefit Balance
Average per year	85810 R	137545 R	98195 R	12385 R
Total amount of the costs for one apprentice/trainee over the whole training duration	302733 R	470625 R	337494 R	34761 R

Figure 19: CBQ South Africa: Cost – benefit calculation comparison between companies employing full-time training personnel and companies engaging part-time trainers only

Apart from the fact that full-time trainers' wages make up a major reason for these differences, the actual amount of time learners spend in real work processes counts for the second strong impact on this result: in companies without full-time trainers, learners spend almost ¾ of their time on workplace-based learning which is only about 55% in companies employing full-time trainers. The percentage of workplace based learning time that is at the level of a skilled worker, compared to the percentage of time filled with tasks at un-skilled or semi-skilled labour is almost equal in both environments.

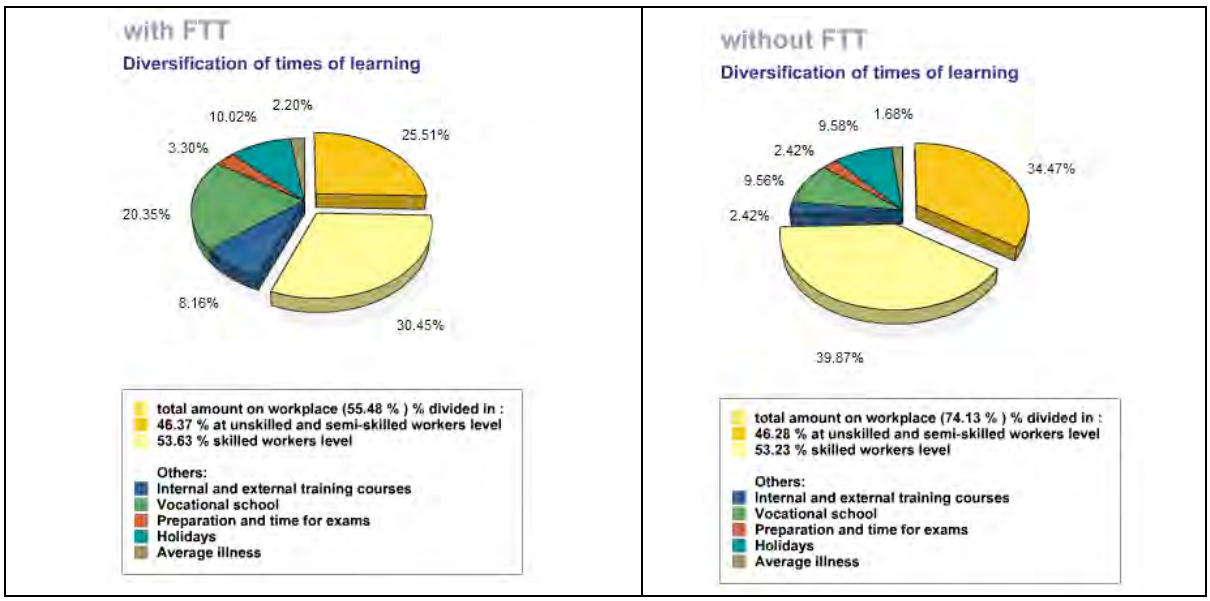


Figure 20: CBQ South Africa: Comparison between companies employing full-time training personnel (n=41) and companies engaging part-time trainers (n=102) – differences in the times and locations of learning.

Operational costs/write downs

Annual write downs, i.e. internal amortisations and current costs (tangible, fixed assets, machines and costs of maintenance) were considered in the CBQ project, if such write downs were directly linked with in-company training purposes.

These cost factors were summed up in two categories:

	Average cost per year all companies, (n = 142)	Average costs per year in all companies, where these costs were relevant (n = 36 (a); n=28 (b))
a) Machines, assets	39,863	152,988
b) Maintenance, rents	51,742	244,913

Table 8: CBQ South Africa: write downs in in-company training. (In this overview total annual average amounts are given without linking this figure to the actual number of apprentices trained.)

Among the cases where such costs were relevant, there were large multinational enterprises (12 cases with a number of employees of 2500 – 9000), companies with 100 – 650 employees (n=11) but also smaller businesses with 51-100 (n=7) or 5-50 employees (n=7).

If one looks at the cost factor of write-downs in comparison to all other training costs, this cost factor does not count for more than 4.8% on average although there are differences related to the duration of training (see Table 11).

Other costs

Teaching and learning material, protective clothing, external training, fees for exams and all further regular costs that occur during the course of in-company training have been analysed under the headline of so-called ‘other costs’. Such costs count for approximately 15% of the total cost of apprenticeship training provided in the companies participating in the CBQ project (for exact figures, including those related to the different courses of training see Table 11). Such costs can be analysed in a way that average amounts are compared according to the different years of training as demonstrated in figure 21 and Table 9. However, because some of these cost factors were not entirely relevant in many of the companies participating in this survey, it also makes sense to analyse all other costs with regards to the different years of training and only with regard to those companies where these cost factors were relevant, in order to receive a more realistic picture on the actual composition of other costs and their relevance in different training courses (see Figure 22 and Table 10).

Whereas in an overall average analysis, other training costs were high in the first as well as in the fourth year of training, the second analysis suggests that there is a decline of the total amounts of other costs during the course of training, starting with about 45,100 ZAR in year one and ending up with around 29,400 ZAR in year four. If one looks at the composition of other costs, external training played a major role, which was, in most cases, highly relevant for the first two years of training (and also especially relevant in courses of training which had an entire duration of only two years).

Other amounts, for example those spent on travel and accommodation or protective and professional clothing remained relatively stable over the years of training.

Other costs - total average results

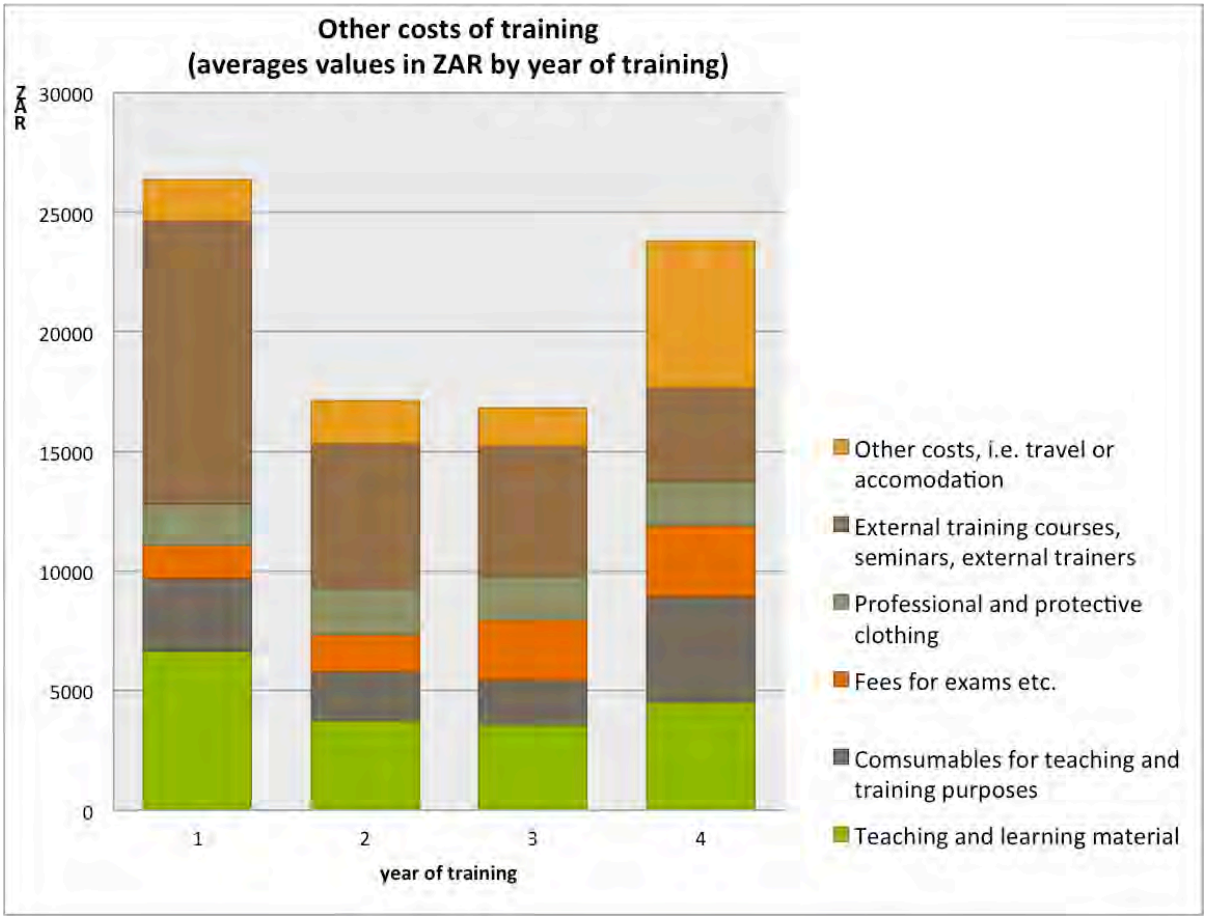


Figure 21: CBQ South Africa: Other costs of in-company training on average per apprentice and year of training (142 cases, consisting of different groups: 1st and 2nd year: n=142, 3rd year: n=126, 4th year: n=60)

Other costs	*1st year*	*2nd year*	*3rd year*	*4th year*
Teaching and learning material	6,650	3,753	3,585	4,531
Consumables for teaching training	3,037	2,022	1,857	4,442
Fees for exams etc.	1,394	1,578	2,498	2,929
Professional and protective clothing	1,743	1,962	1,863	1,834
External training courses, seminars	11,853	6,039	5,443	3,956
Other costs, i.e. travel or accommodation	1,674	1,764	1,573	6,121
Sum of other costs	26,352	17,120	16,822	23,817

Table 9: CBQ South Africa: composition of other costs of training in different years of training as average values (142 cases, consisting of different groups: 1st and 2nd year: n=142, 3rd year: n=126, 4th year: n=60)

Other costs - results referring to companies, where other costs were relevant

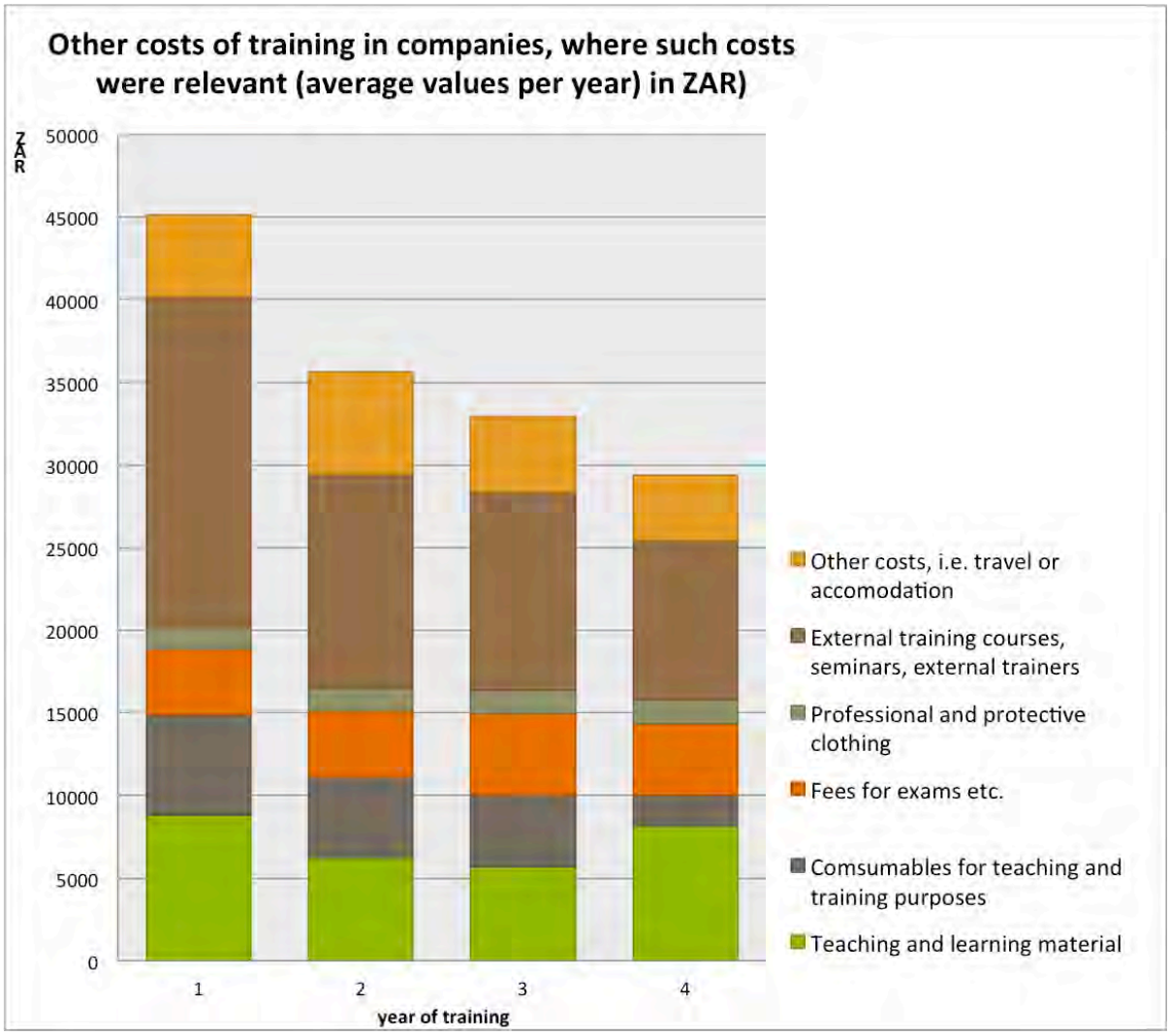


Figure 22: CBQ South Africa: Other costs of in-company training, on average, per apprentice and year of training where such costs were relevant (data entry refers to different group sizes)

Other costs	1st year	2nd year	3rd year	4th year
Teaching and learning material	*8,825*	*6,253*	*5,710*	*8,138*
Consumables for teaching and training	6,074	4,867	4,300	1,913
Fees for exams etc.	3,958	4,001	4,957	4,316
Professional and protective clothing	1,307	1,323	1,448	1,447
External training courses, seminars	20,038	12,993	11,936	9,622
Other costs, i.e. travel or accommodation	4,941	6,174	4,571	3,921
Sum of other costs	45,144	35,613	32,925	29,361

Table 10: CBQ South Africa: Composition of other costs of training in different years of training as average values (average values only refer to companies where such costs were relevant (data entry ranks from 20 (other costs for the 4th year of training) to 132 cases (protective clothes in year 1)

3.2.3 Towards a general cost structure (total average results of all cost factors)

All in all, the results of the calculation of the composition of costs and benefits of the in-company training part of apprenticeship leads to an overview as presented in Table 11. This summary shows the averages of costs and benefits of all CBQ company cases and compares them with the results of a calculation regarding 3-year and 4-year course of training.
Subsidies are considered in this calculation as well.

As one of the major conclusions derived from this calculation, one may say that, for the moment, only companies offering 4-year courses of training obtain a net benefit. Courses with a 3-year duration remain unprofitable on average, even if these courses receive monetary support. As illustrated in the previous sections, such an overview can only demonstrate the average results, and does not take into consideration a variety of aspects that need to be looked at in depth (see, for example, training with or without full-time trainers or far from or within real work processes).

The most important contributing factors to the total costs of training are the training allowances paid to learners, as well as the related staff costs for the training personnel involved. If there are any potentials for savings to be found at all, then here. All other costs play a less significant role and are relatively difficult to reduce – apart from some operational costs or to some extent costs that relate to external training. In this regard it would – again – be necessary to look at each specific company case in order to provide adequate advice.

	Average amounts in ZAR and as a percentage of total costs per year					
Costs and benefits of in-company training	**Average (all cases) n=142**	% of total costs	**Average (3-year courses) n=66**	% of total costs	**Average (4-year courses) n=60**	% of total costs
Training allowances	**-87,141**	**60.2%**	-8,608	**50.6%**	**-74,991**	**53.8%**
Staff costs	**-29,318**	**20.3%**	**-50,224**	**29.7%**	**-41,875**	**30.1%**
Operational costs or write downs (sum),	**-6,997**	**4.8%**	**-13,218**	**7.8%**	**-1,475**	**1.1%**
.....thereof machinery, assets	4,883	3.4%	9,286	**5.5%**	893	0.6%
.....and maintenance, rents	2,114	1.5%	3,932	**2.3%**	582	0.4%
Other costs (sum), thereof	**-21,245**	**14.7%**	**-20,095**	**11.9%**	**-21,028**	**15.1%**
.....teaching and learning material	4,625	3.2%	4,663	**2.7%**	4,630	3.3%
.....consumables for training	2,639	1.8%	2,305	**1.4%**	2,840	2.0%
.....fees for exams etc.	1,969	1.4%	1,823	**1.1%**	2,100	1.5%
.....professional clothing	1,770	1.2%	1,856	**1.1%**	1,851	1.3%
.....external training, seminars	8,100	5.6%	7,778	**4.6%**	6,823	4.9%
.... other costs, i.e. travel	2,142	1.5%	1,670	**1.0%**	2,783	2.0%
Total costs of training	**-144,701**	**100.0%**	**-169,145**	**100.0%**	**-139,369**	**100.0%**
Subsidies and grants	**51,562**	**35.6%**	**59,404**	**35.1%**	**44,900**	**32.2%**
Cost of training (with subsidies)	**-93,139**	**64.3%**	**-109,741**	**64.9%**	**-94,469**	**67.8%**
Benefits of training	**94,785**	**65.5%**	**96,720**	**57.2%**	**101,314**	**72.7%**
Cost-benefit balance	**1,646**	**11.4%**	**-13,021**	**7.7%**	**6,844**	**4.9%**

Table 11: CBQ South Africa: Costs of in-company training calculated on the basis of 142 CBQ data entries

Section 4: Analysis of in-company training quality

This section reviews the results of the quality assessment. Four input and two output criteria of in-company training have been addressed within the CBQ project. This documentation of results will, first, explain the different quality criteria and then provide a general analysis, as well as a more detailed examination of the results based on the companies' performance in the different dimensions of quality being reached in different environments.

4.1 CBQ quality criteria

Quality criteria examined by CBQ	Context of quality criteria (what do they refer to)	
1. Reflective work experience	Input factor	Shaped though the working and learning environment in a company or at the training provider
2. Professional level of training		
3. Autonomous/independent learning		
4. Learning in business processes		
5. Vocational commitment	Output factor	aim and result of vocational education and training
6. Professional competence/fitness for the particular occupation („Berufsfähigkeit")		

Table 12: CBQ quality criteria

Reflective work experience or experience-based learning

Reflecting on one's work experience in a work place environment is central for vocational training. Therefore the amount of time spent on learning in productive work processes can be used as an indicator for the quality of training. Integrating "learning tasks" into the practical training is very beneficial for the development of a learner's competence. A good working and learning atmosphere that also puts some an emphasis on a „culture of errors", i.e., seeing errors as an opportunity for learning, is very supportive as well.

Professional level of training

The higher the degree of complexity of work tasks, the more can be learned. Results of research from a variety of commitment studies (see Hauschildt, Heinemann and Rauner, 2012) have shown that it is always better to slightly over-challenge apprentices than provide too many tasks on an unskilled or semi-skilled workforce level. The criterion "professional level of training" is based on the assumption that it is only the participation in and the independent fulfillment of professional tasks in the work process that guarantees the development of professional competence. CBQ users are asked to what degree the assignments of trainees reach the level of 'professional tasks' (as opposed to 'everyman's tasks').

Autonomous/independent learning

Choosing work tasks in a way so that apprentices need creativity and self-initiative to solve them is a feature of high training quality. The guiding principle of such a training culture is

the so-called “completeness of professional activities” or “complete action circle” which is a core element of training quality. The criterion is supported by extensive research in labour studies and business administration (see Ulich 1994, ch. 4; Rauner 2002, 27ff.) and of was adopted in vocational pedagogy and assigned a relevance that extends far beyond its origins in labour studies (Rauner 2006).

Learning in business processes

Process-oriented training is an important goal of dual vocational training, which implies integrating apprentices into real business processes from the beginning of their apprenticeship. A learner can only comprehend the share of his work if he also has some knowledge about the previous and subsequent steps to be fulfilled in order to deliver high quality products. An apprentice should always have a complete picture always have a complete picture of the structure of the company in which he or she is learning. It is essential to have a good knowledge about what is done in the different departments, who the clients are and what level of quality is expected.

The criterion “learning in the business process” can be linked to a development that started in the 1980s, when, in the course of the re-engineering of enterprises the functional organization of enterprises were replaced by organization based on business operations (flat hierarchies). The introduction of lean hierarchies and an orientation towards a rather vertical division of tasks entailed the transfer of responsibilities into productive work processes and the introduction of participative types of organisational development. In vocational pedagogy these management concepts were adapted for the training process. The result was the paradigm of business process orientation in vocational education (Dybowski et al. 1995).

Occupational commitment

The development of vocational commitment is inseparably linked to the development of professional competence and forms the basis for client orientation and quality awareness. In order to determine the degree of vocational commitment, CBQ builds on empirical studies in commitment research (Rauner/Heinemann 2009).

Vocational commitment is high if apprentices complete their work tasks responsibly and pay sufficient attention to quality. Moreover, vocational commitment can be regarded as high, if apprentices show great commitment to their vocation and are very interested in job matters overall and other issues regarding their vocation. Vocational commitment does not necessarily rise steadily. In fact, on the contrary, motivational aspects sometimes decline during the course of the second year. This mostly happens when an initial and perhaps rather romantic idea of an occupation has to be corrected in the light of work realities.

Fitness for occupation/professional competence

Indicators for a learner’s fitness for occupation are the results of the final examination, e.g. the number of attempts and the adjustment time needed after completion of the training programme to reach the competence level of a skilled worker, also if the learner was trained in a different company environment.

4.2 Average results of the quality analysis

The quality assessment with CBQ has led to a relatively homogenous picture (see Figure 13) with average results varying between 2.55 (fitness for occupation) to 3.13 (independent learning). Point values can also be expressed in school marks: A=1-1,33pts, B=1.67-2.33pts, C=2.67-3.33pts; D=3.67 – 4.33pts and E=4.67 – 5pts.

The quality index that weights the different quality criteria according to the levels reached on average in the different years of training is about 3.33 points on average (n=142). It is more difficult to begin with an in-company training at high quality levels than to reach such levels by the end of training, which is why, for example high quality values in a first year of training have a higher weight compared to the same quality values reached in a final year.

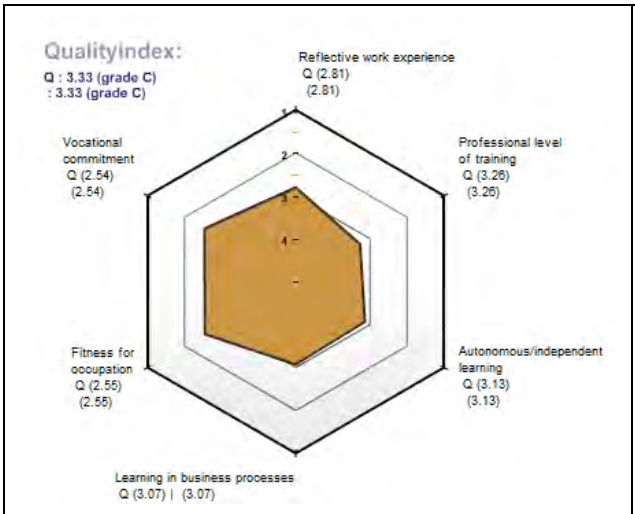


Figure 23: CBQ South Africa: Quality diagram showing average results of 142 cases

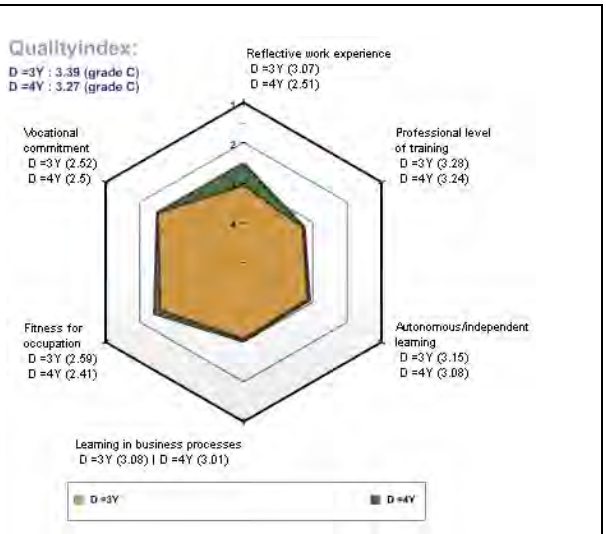


Figure 24: CBQ South Africa: Average quality results and training duration (3years, n=66, 4 years: n= 60)

The equivalent would be a school mark of a week C, which clearly shows that there is still some potential for improvement in all quality criteria. Interesting is the fact that, with regard to the very important outcome criterion, “fitness for occupation” this criterion was estimated as being of higher performance than the other criteria.

If one compares the different courses of training (three years or four years of training) as summarised in Figure 24, the quality results do not differ very much on average. Still, the training quality in a 4-year program as estimated by CBQ users seems to be slightly better on average and especially in the criterion “reflective work experience”, a fact that can be seen as a result of a higher amount of time spent on experience-based learning in a 4-year course.

It is however always a bit difficult to only view results as averages. Figure 25 shows the distribution of quality results according to the different criteria. From this Figure, one can learn that in some criteria the dispersion of results was much higher than in others. For example the criterion “vocational identity” has been estimated as excellent or good in a considerable number of cases, whereas the two criteria “independent or autonomous learning” and “learning in the business process only reached medium values. As for the output criterion “fitness for occupation” the results were more equally distributed among the marks A “excellent” and D “to be improved” compared to all other criteria assessed by the CBQ tool.

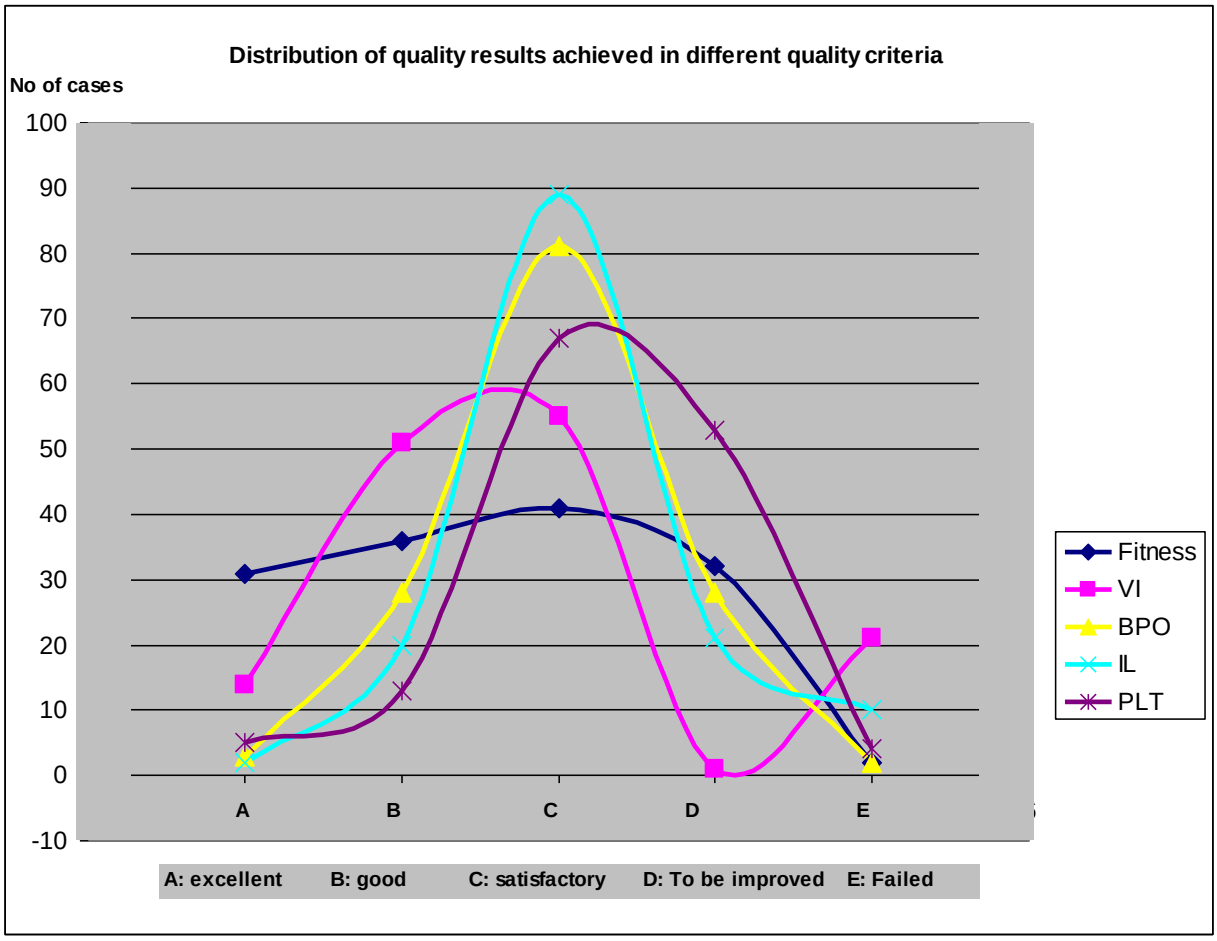


Figure 25: CBQ South Africa: Distribution of quality results achieved in different quality criteria

Fitness=Fitness for occupation, VI=Vocational commitment, BPO=Business process orientation, IL=Independent or autonomous learning, PLT=Professional level of training

In the following section, different single quality criteria will be presented according to the distribution of results achieved in the participating companies (n=142) on average and based on companies grouped by size.

Professional level of training

The majority of companies achieved levels in their training quality that were either satisfactory (47%) or that needed improvement (37%). Excellent or good cases were rather seldom (4% and 9%, respectively), and so were those whose training was seen to be a complete failure (3%). Looking at the performance by company size (Figure 27), very small companies performed slightly better than average. Moreover, companies of up to 50 employees were not confronted with such poor results in the assessment of this criterion.

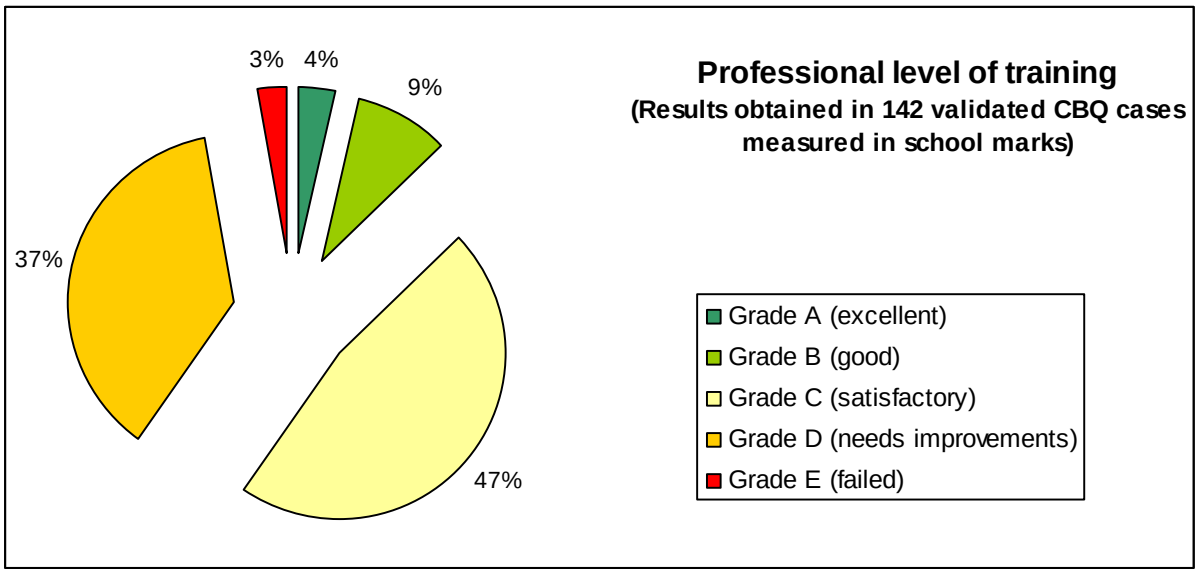


Figure 26: CBQ South Africa: Analysis of quality criterion "professional level of training" – distribution of results from companies participating in CBQ

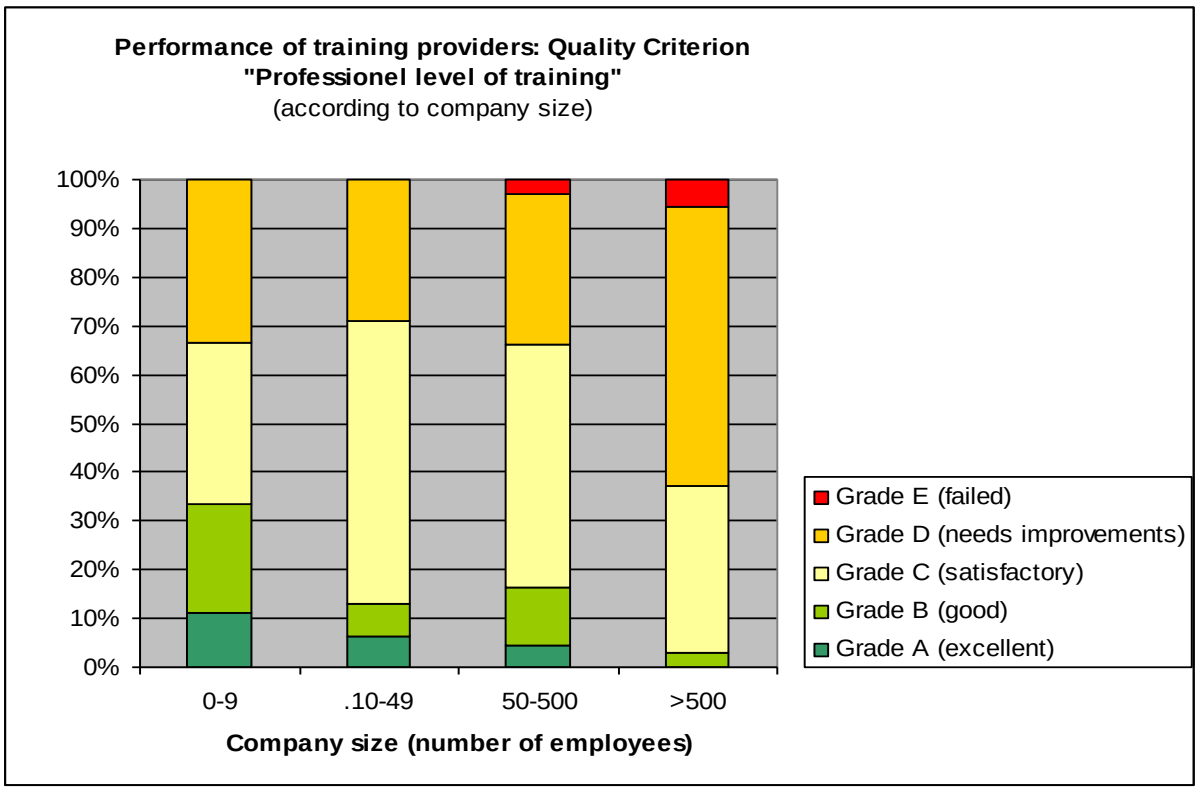


Figure 27: CBQ South Africa: Analysis of quality criterion "professional level of training" grouped by company size

Business process orientation

Learning in the business process was excellent or good in 22% of the cases, and in almost 2/3 of all cases, quality reached a satisfactory grade which applied to companies of all sizes. Again, among bigger companies, there were some cases, where the needs for improvement were higher than in other companies.

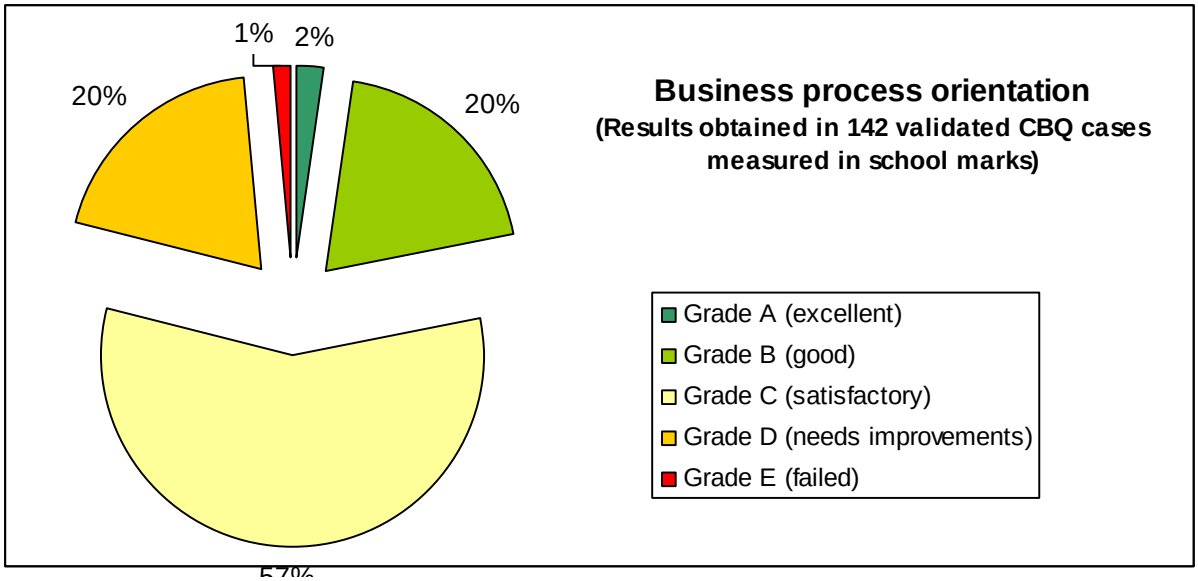


Figure 28: CBQ South Africa: Analysis of quality criterion "business process orientation" – distribution of results from companies participating in CBQ

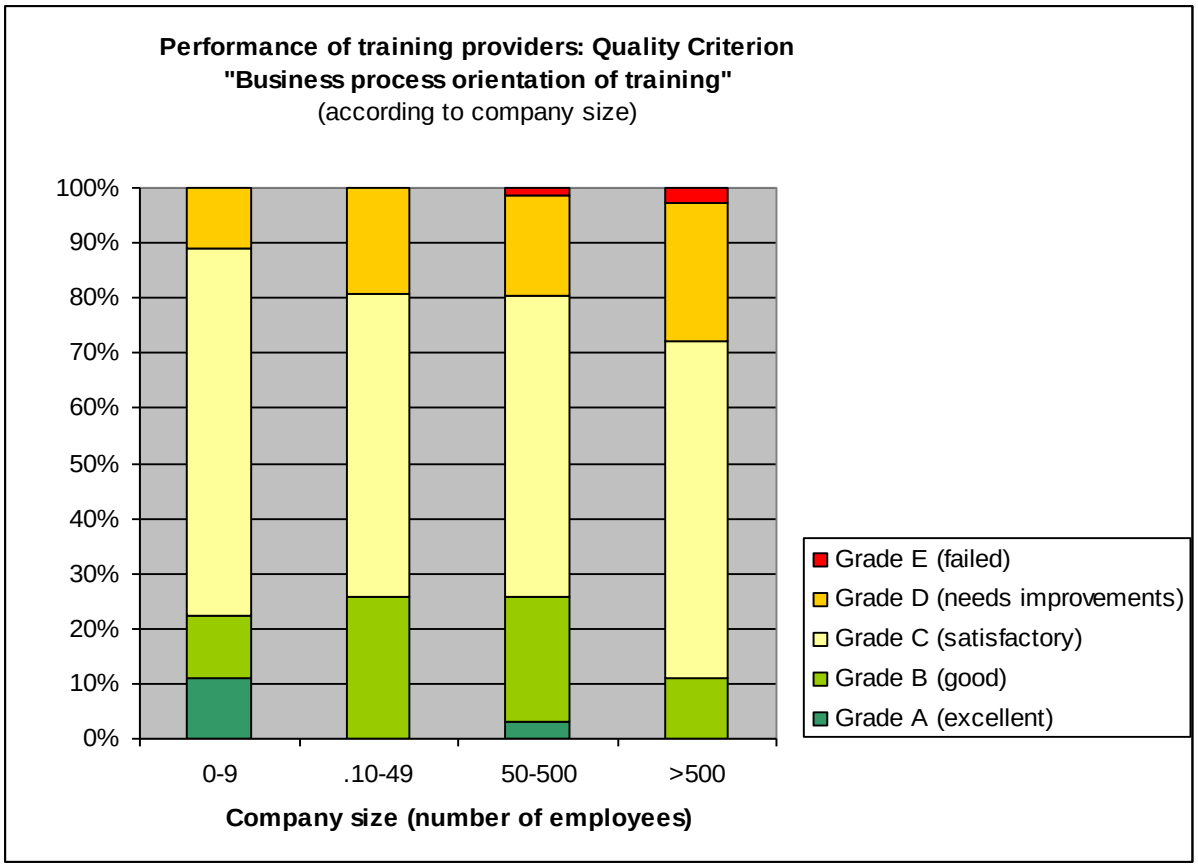


Figure 29: CBQ South Africa: Analysis of quality criterion "business process orientation" and grouped by company size

Independent or autonomous learning

Independent or autonomous learning was much better in micro or smaller companies than in larger ones (Figure 31). It goes without saying that in larger businesses and very structured in-company training schemes, there might be less room for independent learning than in very small companies, where an apprentice is easier confronted with work tasks that require individual creativity and an approach to problem solving that takes place without the direct involvement of trainers or advisors.

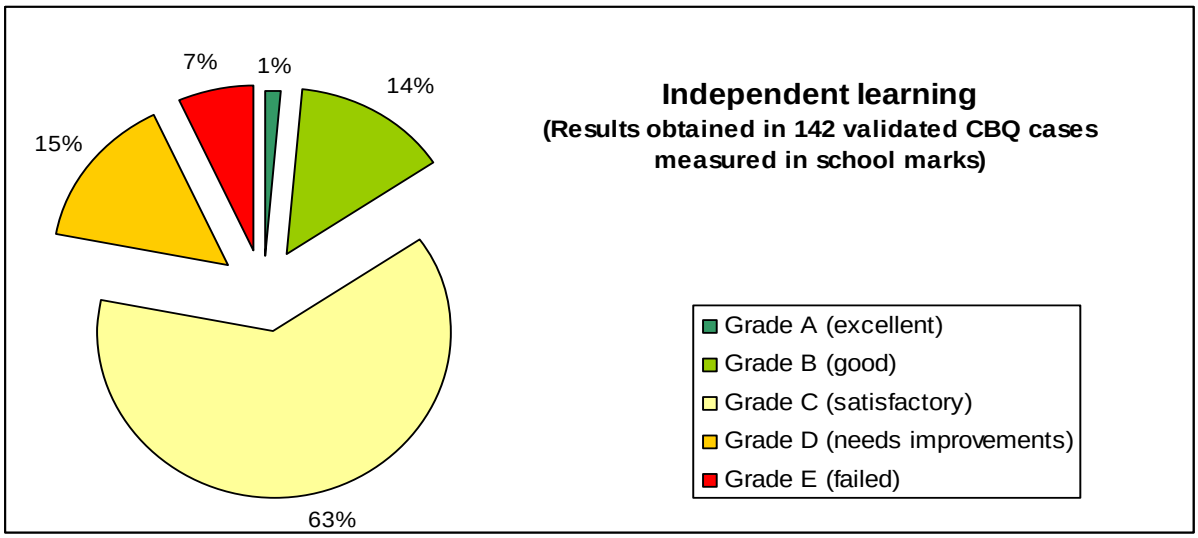


Figure 30: CBQ South Africa: Analysis of quality criterion “independent or autonomous learning” – distribution of results from companies participating in CBQ

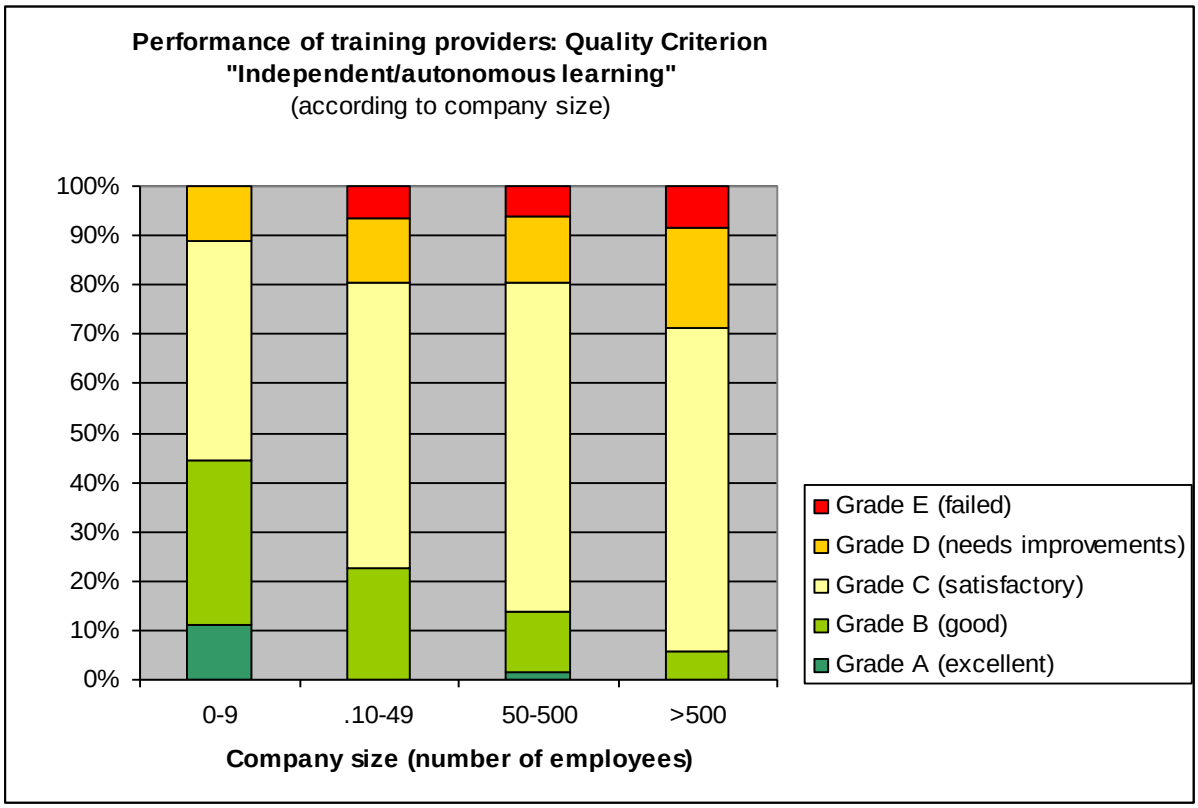


Figure 31: CBQ South Africa: Analysis of quality criterion “independent or autonomous learning” grouped by company size

Vocational commitment

Vocational commitment was good or excellent in almost half of all company cases. 38% were at a satisfactory level, but 15% of the assessments were very poor (Figure 32). Interestingly, such cases existed in companies of all sizes. There was not much difference between the companies of the various sizes. It would seem that vocational commitment is equally developed among all in-company training providers examined.

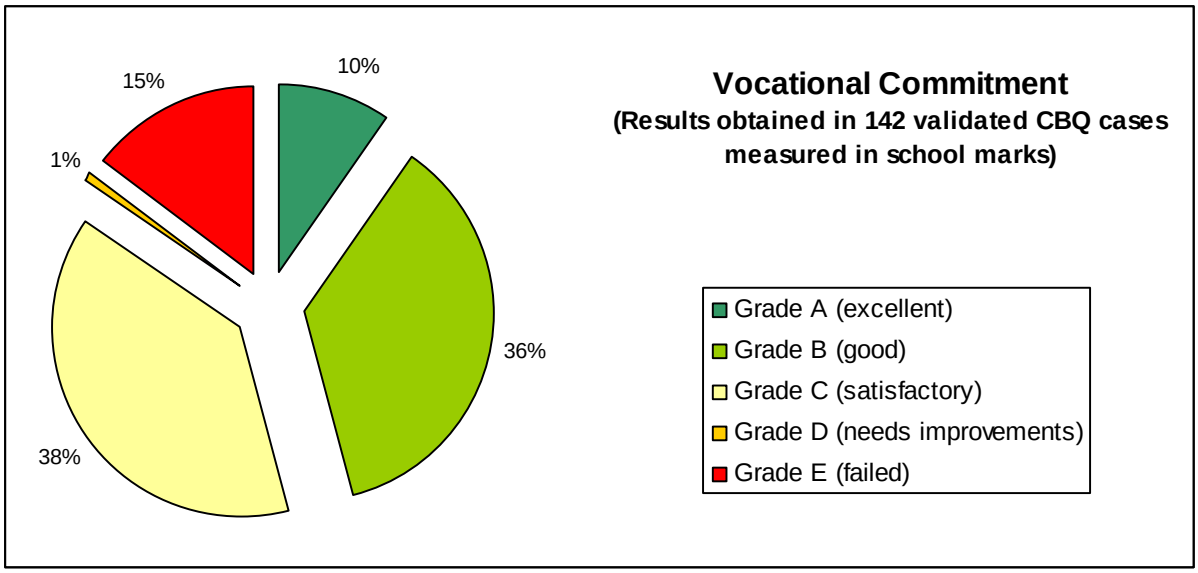


Figure 32: CBQ South Africa: Analysis of quality criterion "vocational commitment" – distribution of results from companies participating in CBQ

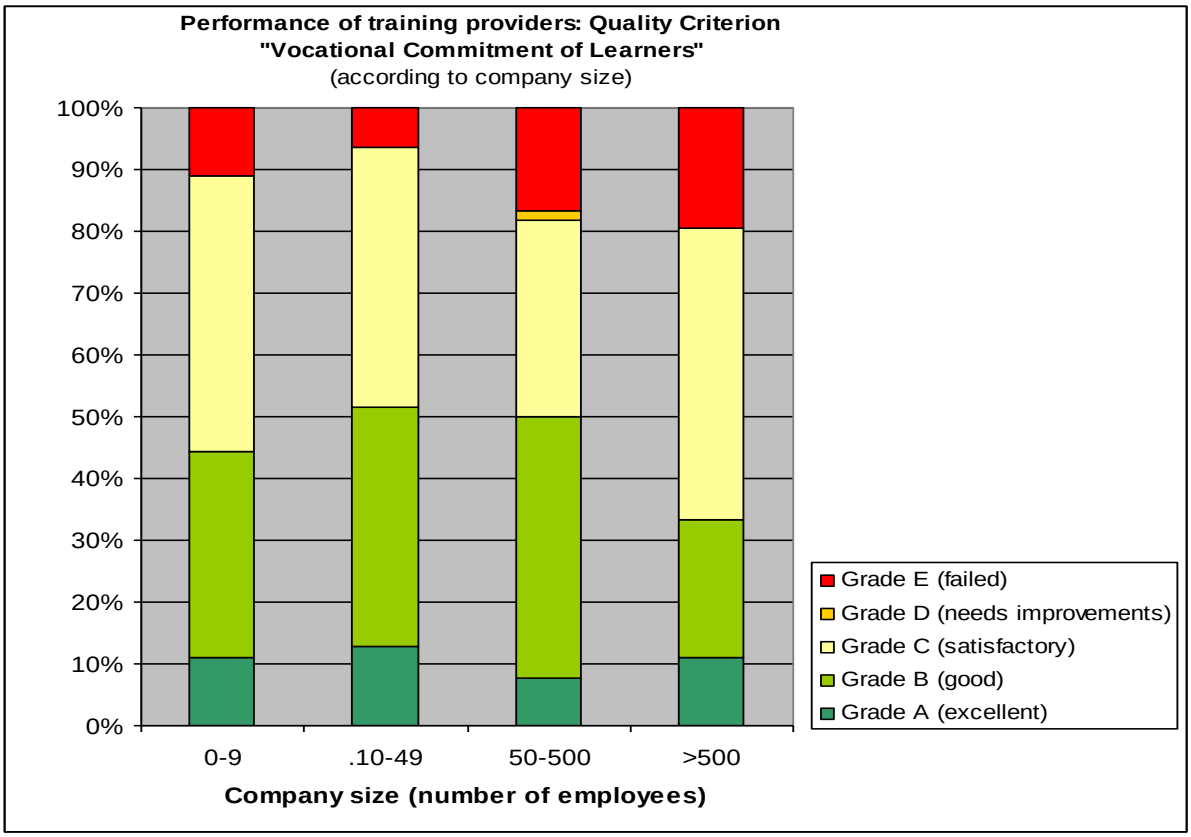


Figure 33: CBQ South Africa: Analysis of quality criterion "vocational commitment" grouped by company size

Fitness for occupation

An average learner's fitness for occupation was found to be good or excellent in 47% of all CBQ companies at the end of training. The best results were achieved in "micro" businesses or in companies with 50–500 employees. In about 23% of all cases there was still need for improvement, which was the case for all different sizes of company (Figures 32 and 33).

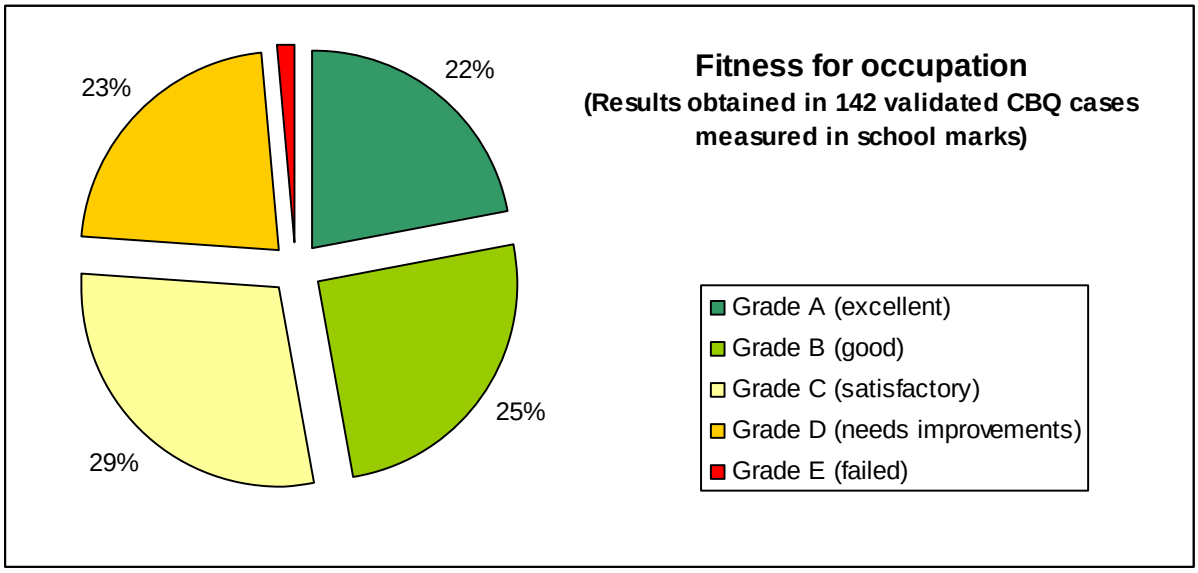


Figure 34: CBQ South Africa: Analysis of quality criterion "fitness for occupation" – distribution of results from companies participating in CBQ

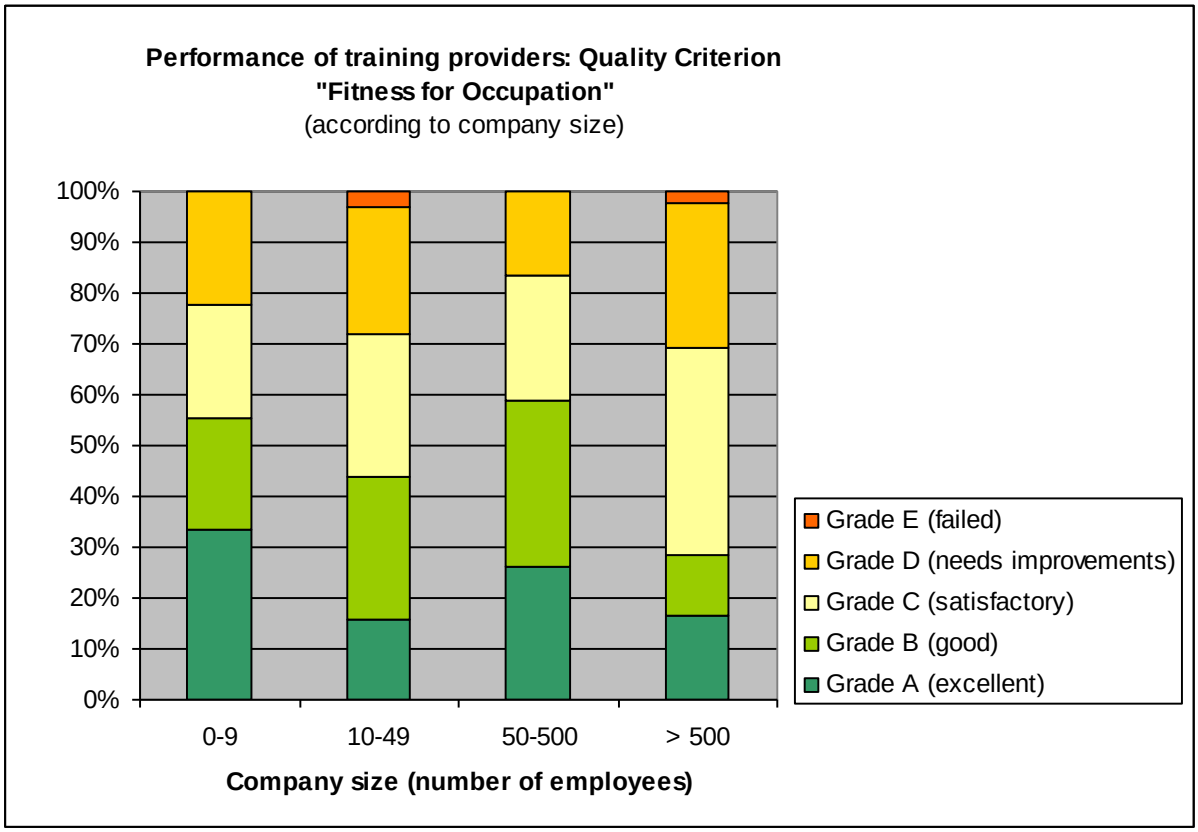


Figure 35: CBQ South Africa: Analysis of quality criterion "fitness for occupation" grouped by company size

Average development of performance in selected quality criteria in training courses of a duration of 3 and 4-years

When analysing the development of training quality provided in the different training courses, it is striking that - on average - companies only achieved higher results towards the end of their training. In order to illustrate this issue, two quality criteria namely "independent/autonomous learning" and "business process orientation" shall be examined, also with regard to the duration of the two major courses of training: three years or four years (Figures 36 and 38). In both examples, the quality started at lower levels in a course with a 4 year curriculum, but then achieved the higher maximum results at the end of training. 3-year courses reached these higher levels a bit earlier.

The general result of the relatively low values at the beginning of training compared with achievements in the final year was already observable after the pre-test phase of the instrument in 2012 (Figures 37 and 39) but still needed to be confirmed and looked at on a more solid database. It is important for any conclusions regarding further ameliorations that this result can now be confirmed.

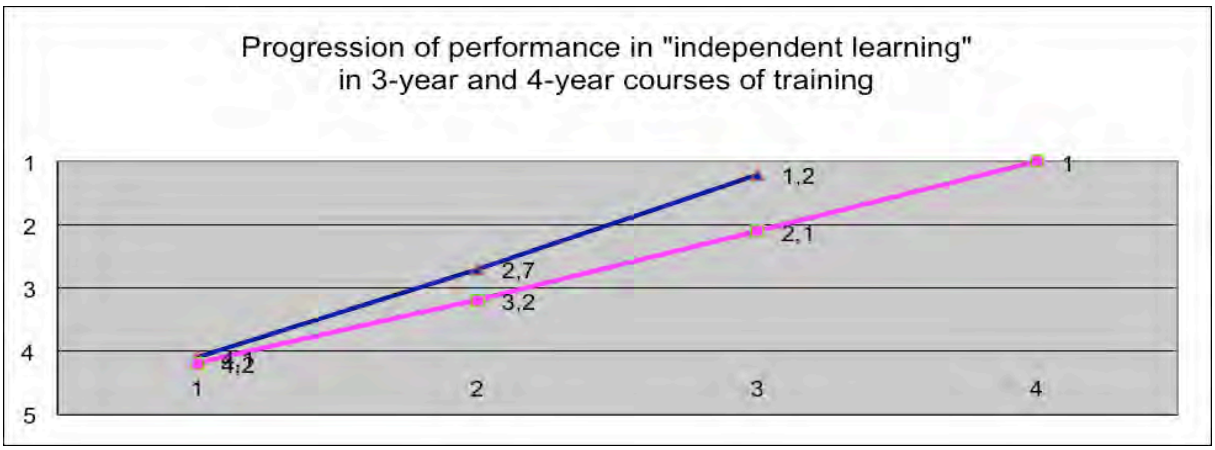


Figure 36: CBQ South Africa: Progression of the quality criterion "independent learning" (3year courses: n=66; 4-year courses: n=60)

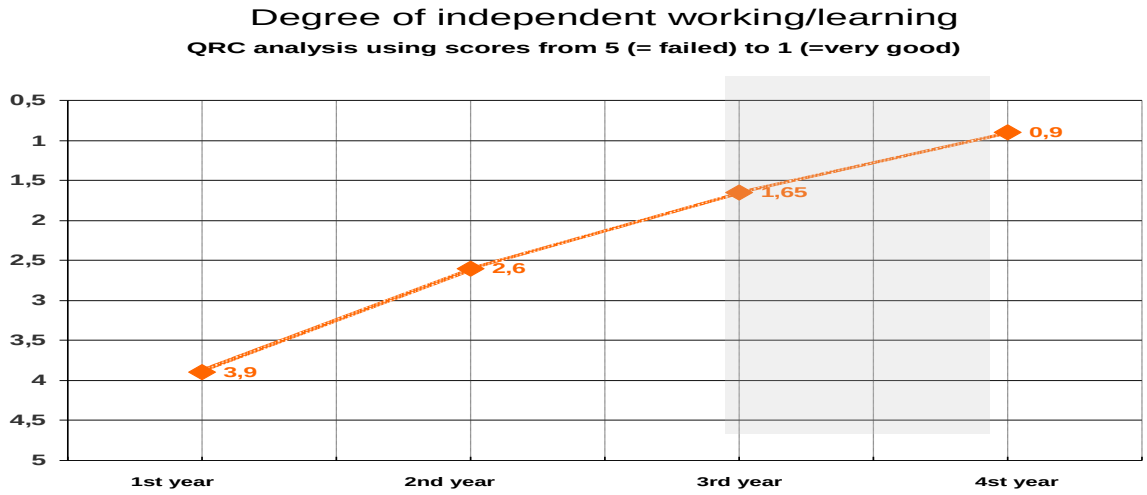


Figure 37: CBQ South Africa: Progression quality criterion "independent learning" (results of the pre-test 2012). Average results of all companies – without distinguishing between different courses of training) n= 36

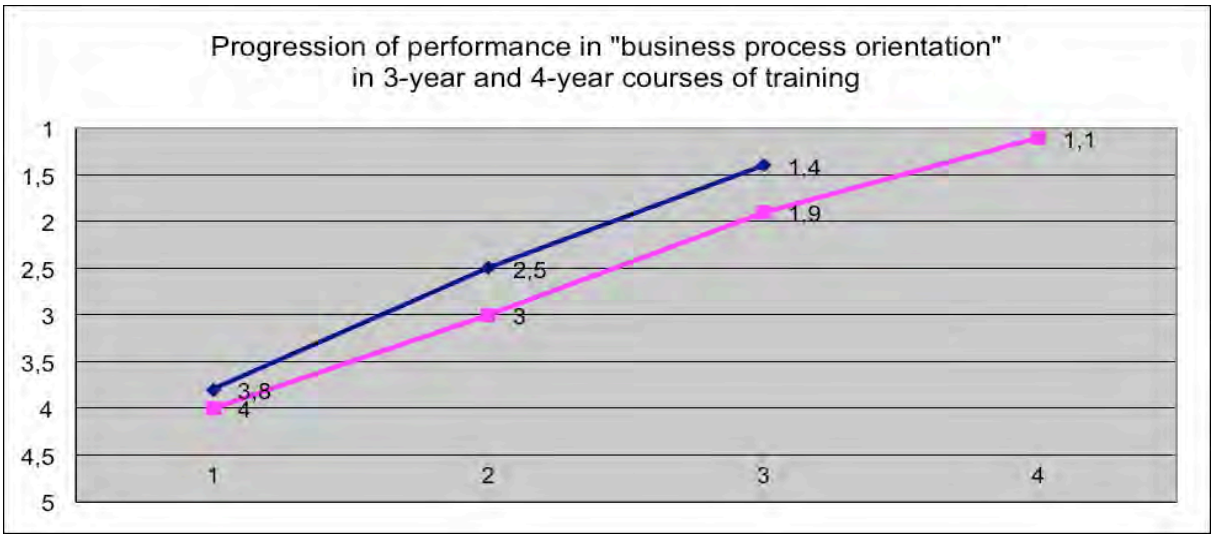


Figure 38: CBQ South Africa: Progression of quality criterion “business process orientation” (3year courses: n=66; 4-year courses: n=60)

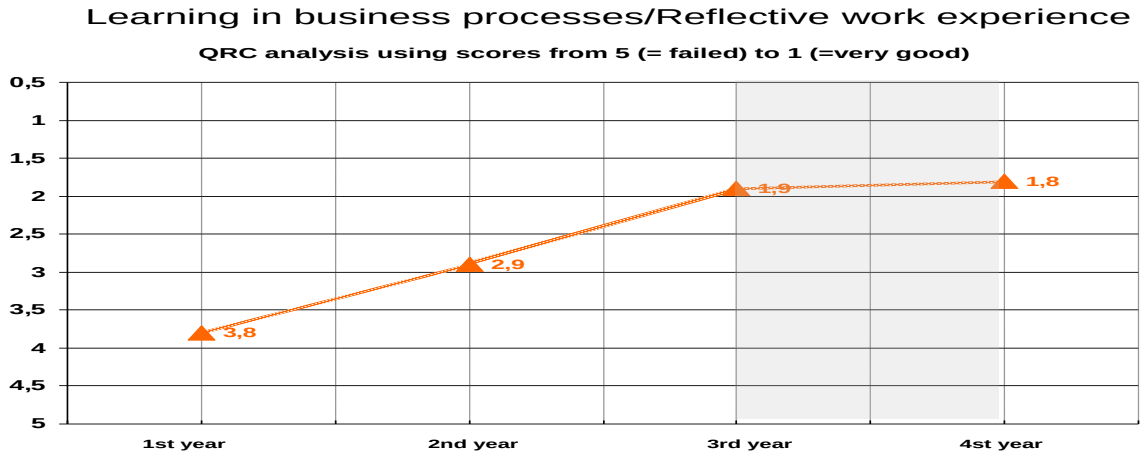


Figure 39: CBQ South Africa: Progression quality criterion “business process orientation” (results of pre-test 2012). Average results of all companies – without distinguishing between different courses of training. n = 36

Diversification of times of learning

According to the CBQ data base, the total amount of learning time spent in the workplace is about 69% on average (throughout the entire duration of training), while the share of time that is dedicated to working at a skilled worker’s level is about 54%. This can be contrasted with the 46% of a learner’s time where work is done at the level of semi-or unskilled workers (Figure 40).

When looking at the different training courses, the picture differs insofar as learners in a four-year course of training spend about 78% of their time in the workplace which is about 63% in an average curriculum of three years (Figure 41). But even if learners in longer training courses have the opportunity to spend more time in workplace-based learning, the share of time they spend on jobs that are at the level of a skilled worker (54%) is almost equal to the share of time a learner in a 3-year course spends on such tasks (53%). Supposing that learners in a longer training course can reach the same knowledge levels in three years compared to learners in a course of training with such shorter duration, one can argue that the amount of

time dedicated to work at the level of a skilled worker should be a lot higher in a 4-year training course, which would also add to more favourable values in the cost-benefit calculations for such training courses.

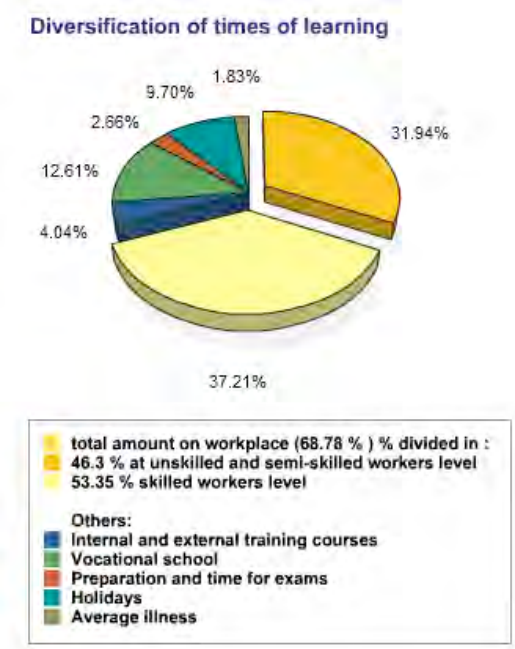


Figure 40: CBQ South Africa: Average diversification of learning times (n=142)

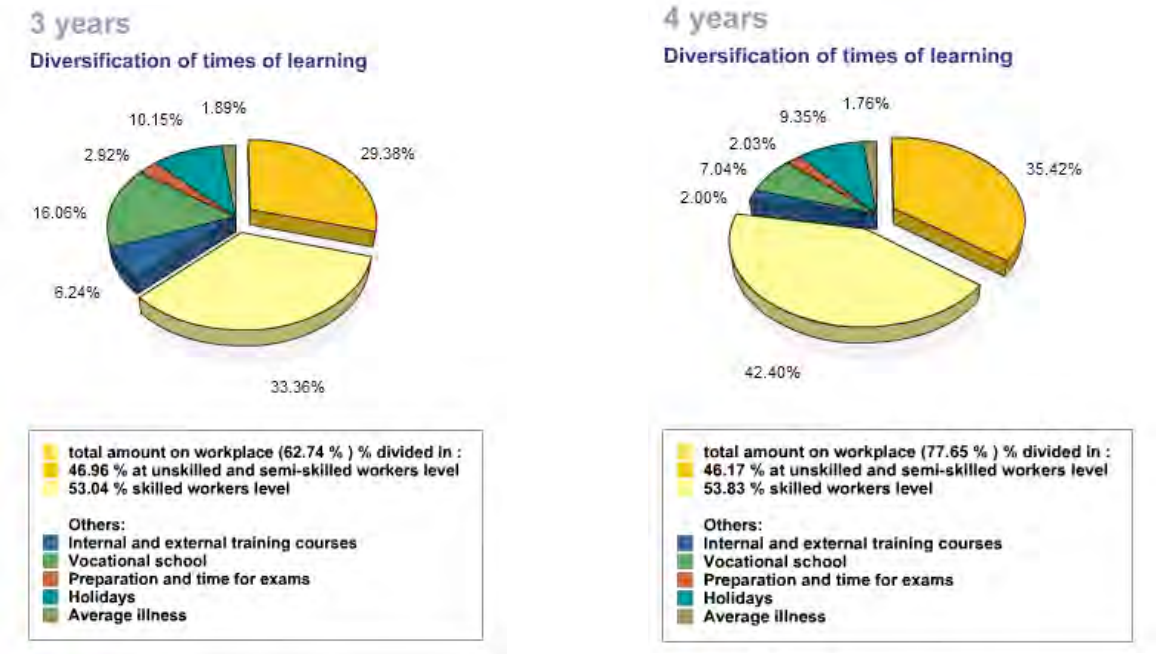


Figure 41: CBQ South Africa: Average diversification of learning time in 3 and 4 year training courses

This observation is also relevant for the analysis of apprentice productivity in the different training courses (Figure 42 and 18, section 3 - cost-benefit analysis). In the bottom graph in Figure 42, one can recognise that apprentice productivity in a 3-year training course seems to reach the proficiency level of a skilled worker earlier than in a 4-year course of training. In this regard there might be some general potential for improvement in the courses of longer duration, which would add to a more beneficial cost-benefit calculation and for better quality result for these curriculums.

Apprentice Productivity

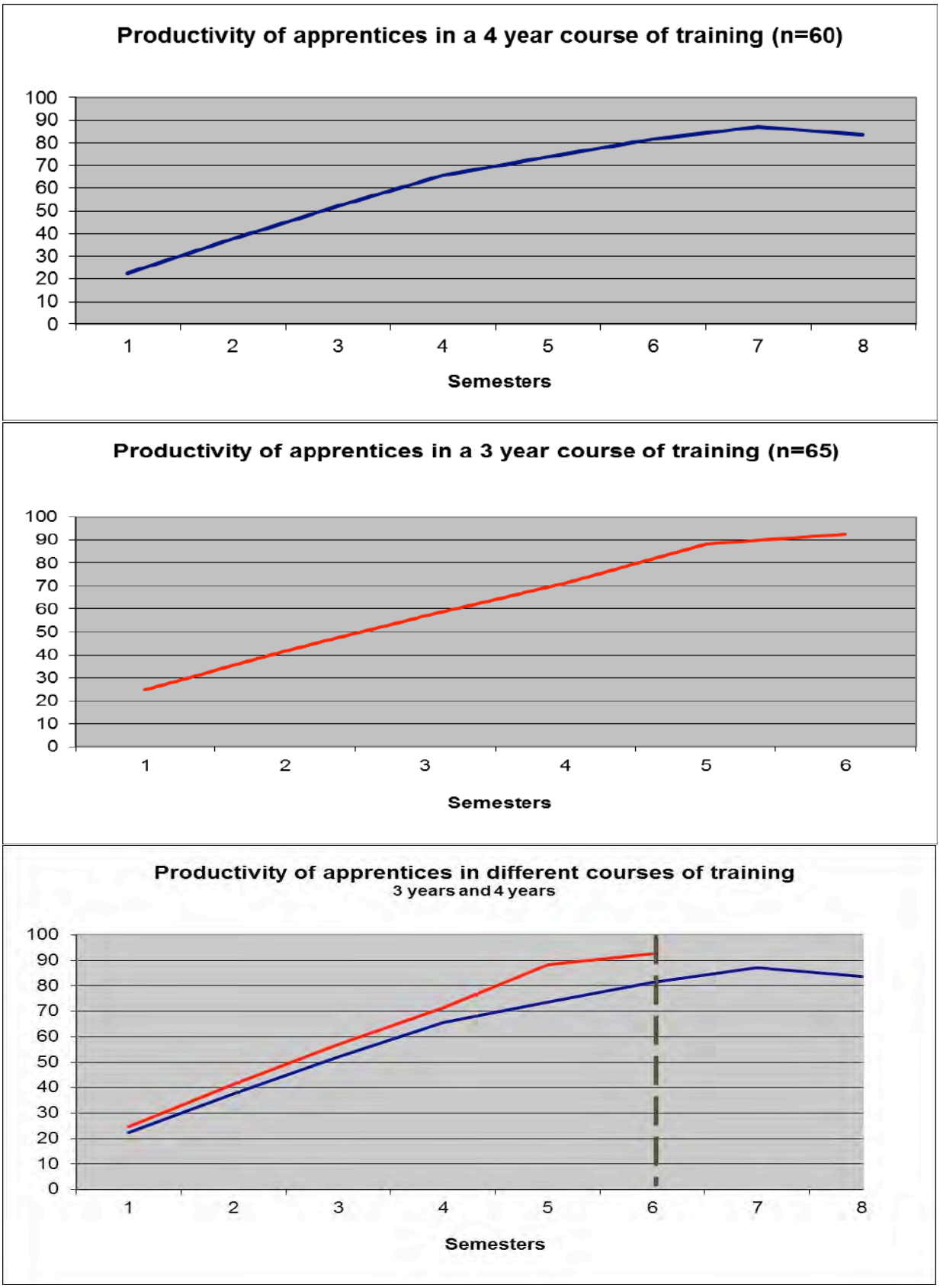


Figure: 42: Productivity of apprentices in different training courses (duration of training 3 years: n=66; 4 years: n=60)

Section 5: Linking costs and benefits with quality

Scatter plot diagrams

Scatter plot diagrams combine the results of both parts of the CBQ analysis: the cost–benefit balance on the one hand and the quality results on the other. In this section, scatter plot diagrams will be documented according to the general results of the project but also as a function of company size and of some selected vocations trained (further examinations relating to other vocations and to chambers of occupations are provided in a separate data report (unpublished) and in the appendix of this report.)

CBQ cases can be summarised in a four field matrix which allows for a combined representation of results. The vertical axis represents the values obtained in the quality analysis (from low (bottom) to high (top of the axis). The horizontal axis reflects the cost-benefit results of a company case, from high cost (left) to high benefits (right) and equilibrium of costs and benefits at the coordinate axis.

Figure 43 shows the performance of all 142 companies offering in-company training. All points in the right field on the top represent company cases where both quality and cost-effectiveness of in-company training are high. These cases can be considered as innovative. Best practice cases like this have also been found within the course of the South Africa CBQ project, and represent companies of different sizes. In this general overview, the calculation was made including the provision of subsidies, so that cases where such support was not provided are represented along with the great majority of cases where they were provided.[3]

Overall result: 142 validated cases

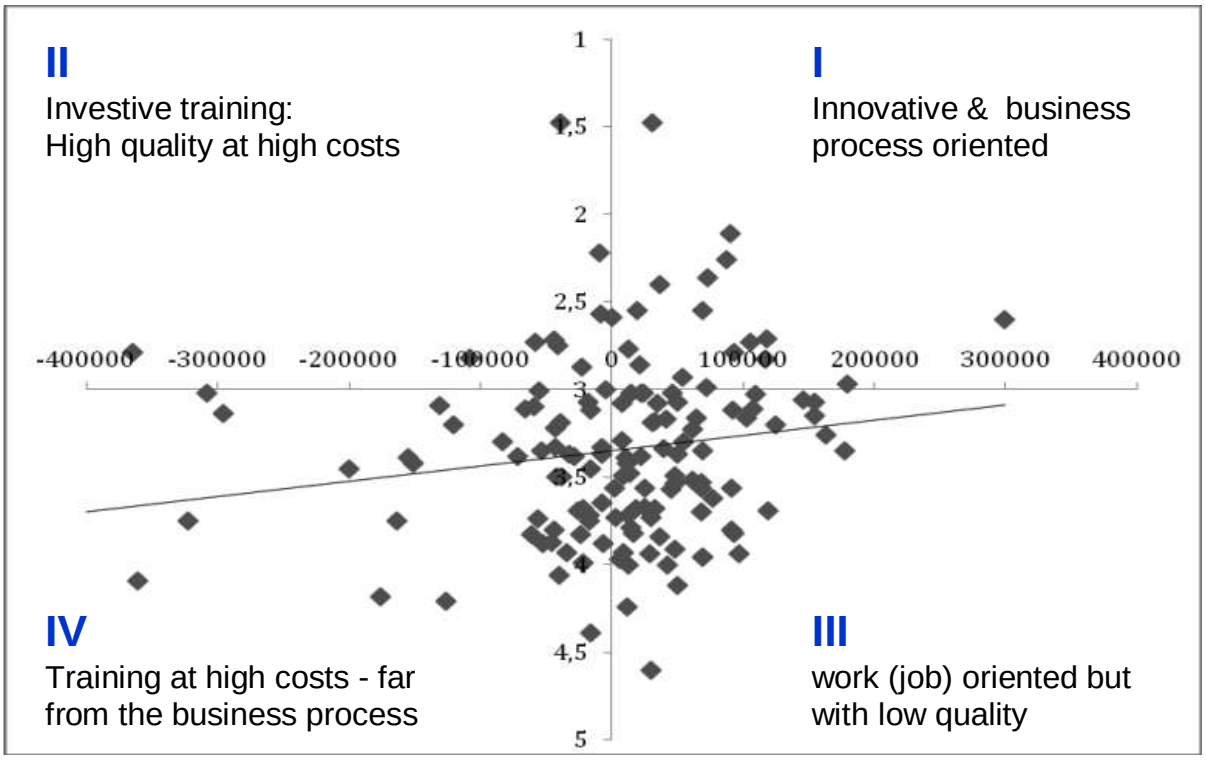


Figure 43: Scatter plot diagram CBQ results from 2011–2015 (n=142)

[3] This refers to all scatter plot analysis made in this section.

Results in all other fields, namely II, III and IV, are sub-optimal. Company cases in field II represent high cost training, which nevertheless trains apprentices at a high quality level. If companies end up with a result in field III, there is a lack in training quality but cost-efficiency is achieved. Such cases can often be found in companies where apprentices are used as low-cost labour. A result in area IV would mean sub-optimal outcomes, as both quality results as well as the cost-benefit ratios remain negative on average.

Performance of smaller and larger companies

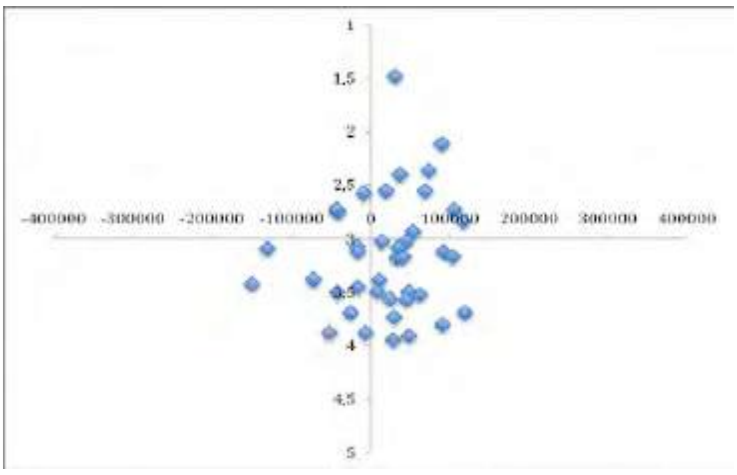
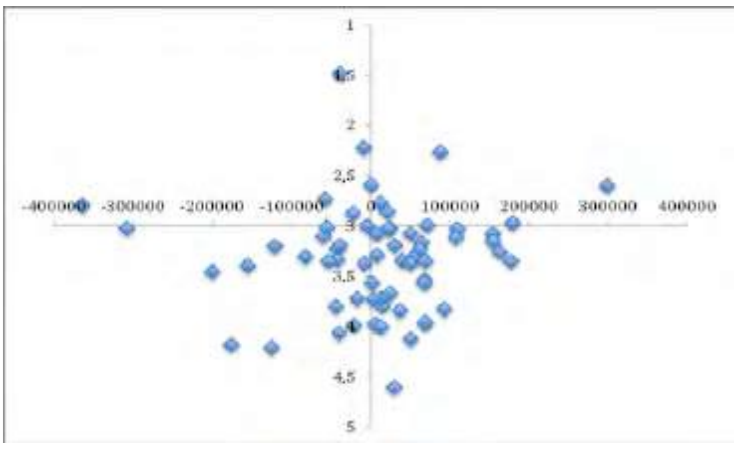
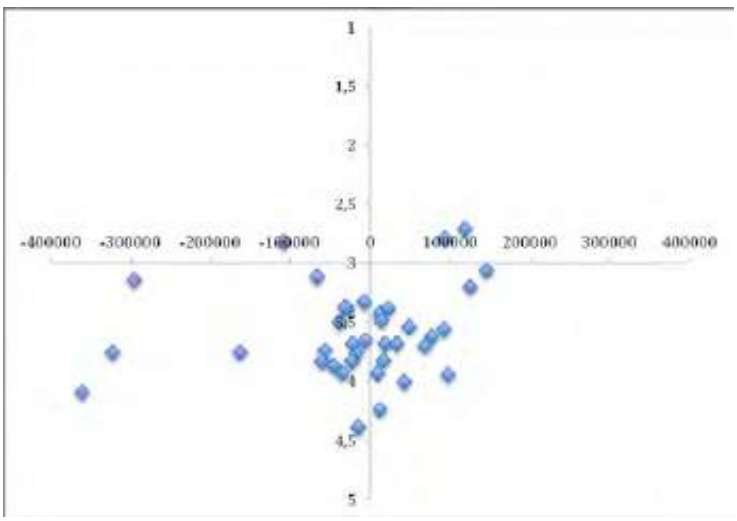
	Dispersion of CBQ results in in micro (0-9) and small businesses (10-49 employees) (n=40)
	Dispersion of CBQ average company results in medium size enterprises (50-499 employees), (n=64)
	Dispersion of CBQ average company results in large companies (more than 500 employees) (n=38)

Figure 44: Dispersion of CBQ cases according to different company sizes

Figure 44 shows the results of company cases according to different company sizes and it becomes obvious that larger companies have greater difficulties to reach a positive cost-benefit balance as well as adequate quality levels. This cumulative result reflects the previous analysis of cost benefits in section 3 and of the quality assessment in section 4.

Performances according to training duration

Scatter plot diagrams calculated on the basis of CBQ data also serve to create comparisons between different courses of training (see Figure 45). From this diagram below, one can derive the average differences in the performance of 3-year and 4-year training courses of regarding the entire training period as well as the final year of training. As analysed in Sections 3 and 4, a 4-year course achieves slightly better results in both aspects.

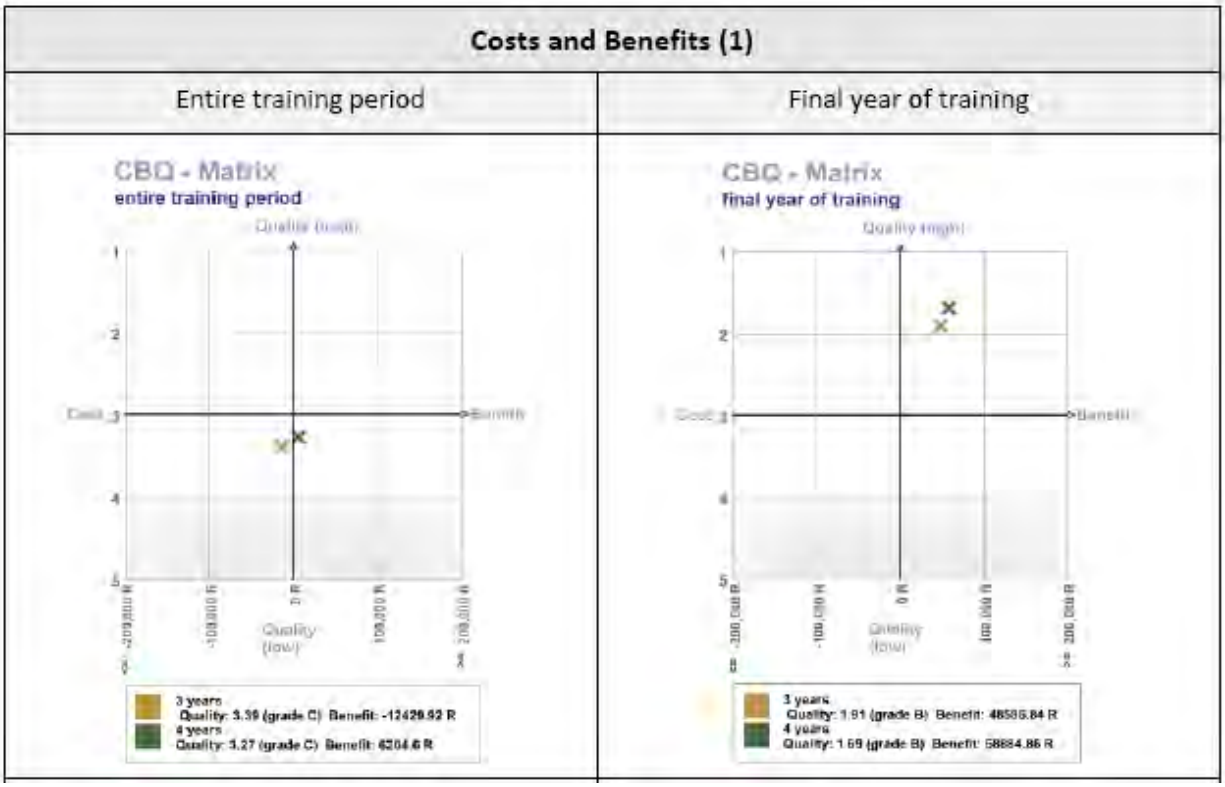


Figure 45: Scatter plot analysis by the duration of training (3 years, n=66) or 4 years, n=60)

In this context it also makes some sense to look more in detail at the differences in performance for some single professions (see Figures 46 and 47).

The two following comparisons of training courses of electricians and millwrights trained in three or in four year courses reveal the big differences between some of the individual offers for in-company training provided by training firms. It also documents that in many companies there is still some unused potential–both in terms of training quality as well as in terms of the exploration of the benefits that in-company training offers.

Further results regarding performance in different vocations trained and also by chambers are summarised in Appendices I and II. Often, the best cases include training courses for motor mechanics as well as motor vehicle repair and maintenance professionals. Very problematic cases have been found in all vocations being trained – a result that, correspondingly, applies to the analysis by the different chambers of occupation.

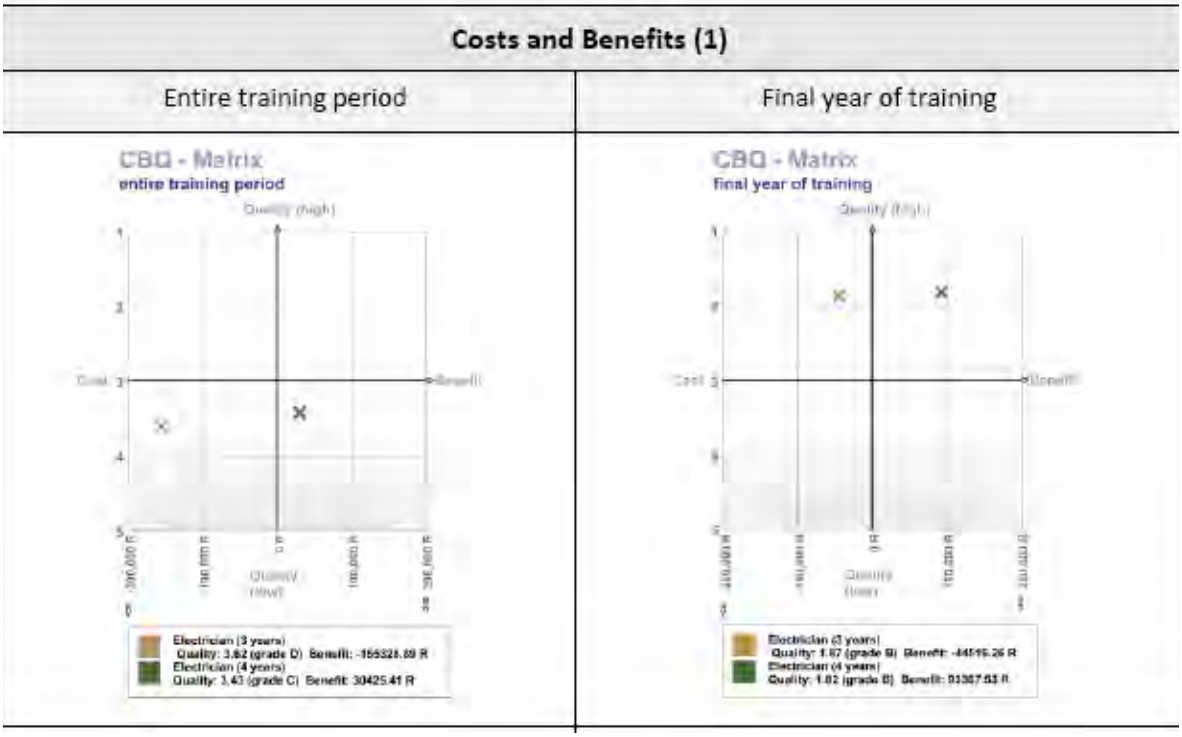


Figure 46: Scatter plot analysis of companies training electricians in different courses of training 3 years (n=3) or 4 years (n=6)

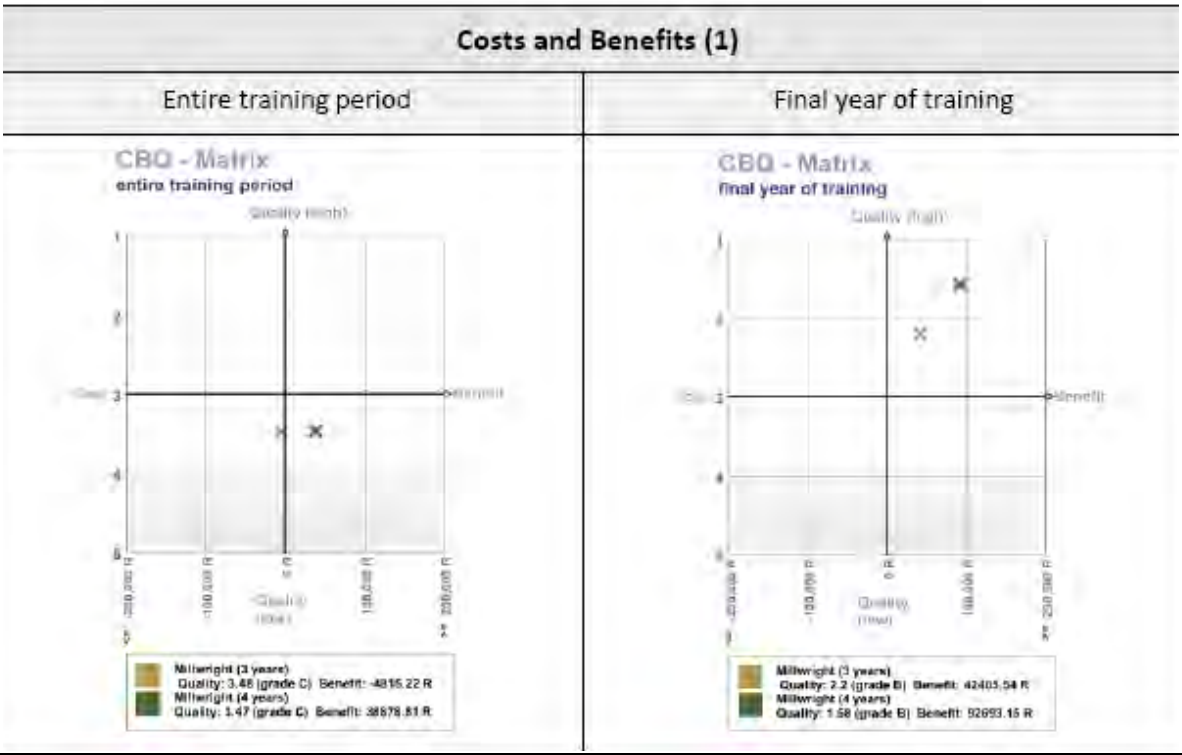


Figure 47: Scatter plot analysis of companies training millwrights in different courses of training - 3 years (n=3) or 4 years (n=3)

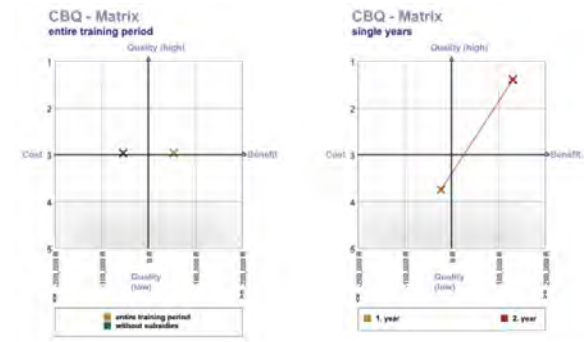
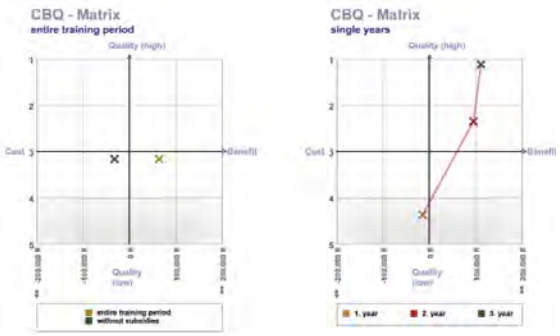
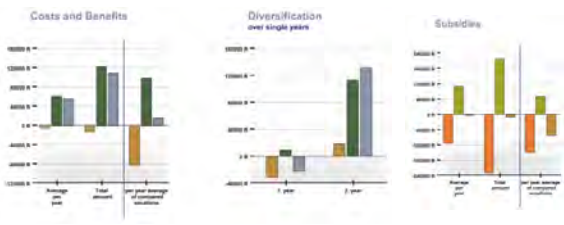
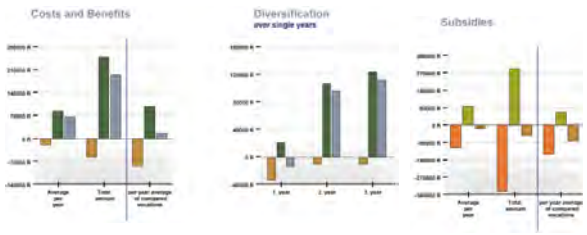
Section 6: Potentials for consultancy

The general and overarching aim of the CBQ project is to provide a "VET controlling system" for employers. Such VET controlling also implies that the information gathered from the analysis of a single data entry can additionally serve for decision making about the future design and management of in-company training provided in the specific case. Some South African companies who have used the instrument at an early stage of the project have been invited to re-enter their data based on their actual situation–i.e. after an initial consultation and a subsequent phase of adjustments.

Even though it is still too early to derive a general conclusion from an analysis of CBQ as a consultancy instrument, due to the relatively low number of cases, there is a strong indication of considerable potential for its further use. The topic is currently being examined within a PhD project supported by the merSETA[4] so that there will be some more detailed information in this regard in the near future. In order to illustrate some general potential for CBQ as a consultancy tool and its benefits for individual companies, two company cases shall be presented on an anonymous basis.

Case 1

This case refers to a company that has twice examined its in-company training provision, first in 2012 and again in 2014. The case has been looked at within the aforementioned PhD project and summarised in a publication at the 6th International Conference of the INAP network. The following graphs demonstrate the considerable changes which took place in a company that used to train apprentices in a 2-year course, and then decided to offer training in a 3-year curriculum, due to some new considerations relating to the cost-benefit aspects associated with a shorter duration of training.

Costs and Benefits (2012)	Costs and Benefits (2014)
	
	

[4] The topic titled „Efficacy of the CBQ instrument as a tool for advisory in in-company apprenticeship training to foster quality development, quality assurance and competence development" is being explored by Ms Lusanda Bantwini, PhD candidate, University of Bremen, beginning in 2014.

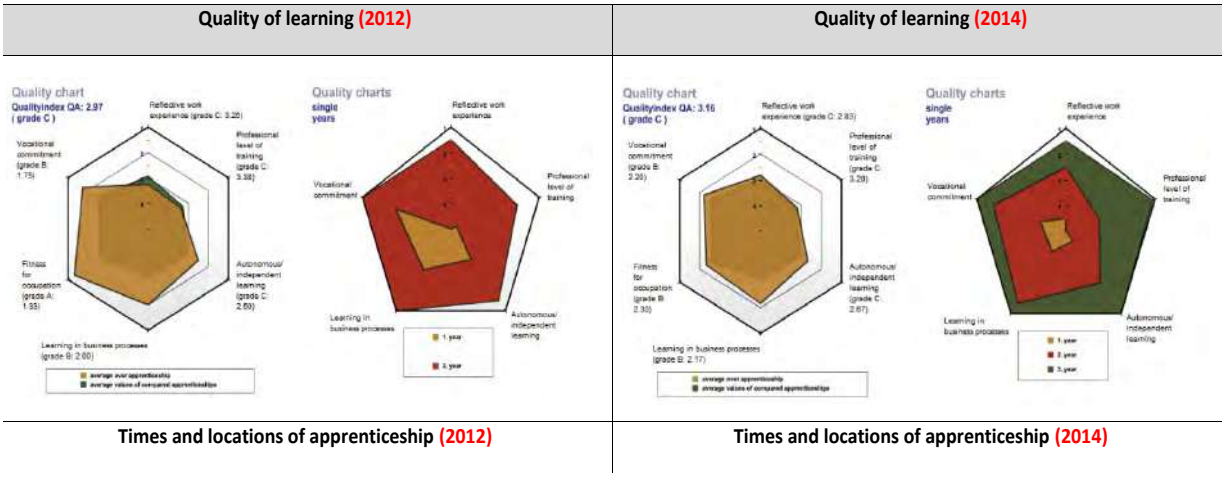


Figure 48: Cost-benefit and quality development within the project process. Individual company case illustrating the potential of CBQ as advisory tool.

The following paragraph cites the more detailed interpretation of this case, as summarised by L. Bantwini and T. Mungoni, who monitored this case.

> *"The figures Cost and Benefits and Quality 2012 and 2014 illustrate some probable degree of the changes in cost-effectiveness and quality. The company receives subsidies for conducting the training and has a total number of six apprentices. When the company was first introduced to CBQ, the apprentices in this trade were spending only about 44% of their training time during the training in the workplace and this is quite low if the apprenticeship is to yield higher quality and returns for employer. Ideally, this time should be as much as 80%. Likewise, the level of tasks they performed was pitched at skilled level was as low as 25%, the rest was pitched at semi-skilled and low-skilled level. Apprentices spent about 36% of their time in vocational schools. (…). Initially the apprenticeship training was running over a two-year period. The post-advisory results of 2014 depict how the changes in the structure of the apprenticeship training have optimized its cost-effectiveness and quality. One of the (strongest) changes evident in this case (when it did another case in 2014) is that the duration of the apprenticeship increased from 2 – 3 years. The results confirm that the power of the tool is visible when advisory is done on medium to long-term (…). Both cost-effectiveness and quality development improved significantly, and this is attributable to some combination of the following changes; training time in the workplace increased from by 22% to 66%; time spent in the vocational schools dropped by more than half to 15.4% and the company optimised cost-effectiveness since (the) first year, as the apprentices were contributing more productively. The complexity of task(s) also intensified, as (did) independent learning. Quality improved and the outcome could be evidenced by the (increased) professional development. Reflective work experience still presents further opportunities for optimisation"*
>
> Bantwini, L.; Mungoni, Ths. (2015)

Case 2

In this specific company, the examination also took place twice, first in 2011, during the pilot phase of the project, and again in 2014. In this case the company decided to reduce the duration of apprenticeship from 4 to 3 years, and to reduce the training time of internal trainers from 15h per week and apprentice to half an hour per week and apprentice. Meanwhile, the number of apprentices trained within the same course of training rose from 28 to 59 learners. External training courses were cancelled completely; while, instead, there was a shift towards special training courses from an average of 5 days per year in 2011 to 180 days per year in 2014. As for the change in terms of training quality, there was a large increase in the quality level of work tasks in the first year and a reduction in the number of apprentices who failed their exams. However, the company only achieved lower levels of quality for the criterion "learning in business-processes" and the actual percentage of workplace-based learning declined, so the bottom line is that there are still some aspects needing to be addressed for with regards to the design of future training courses in order to make them even more attractive and beneficial for the company and the learners.

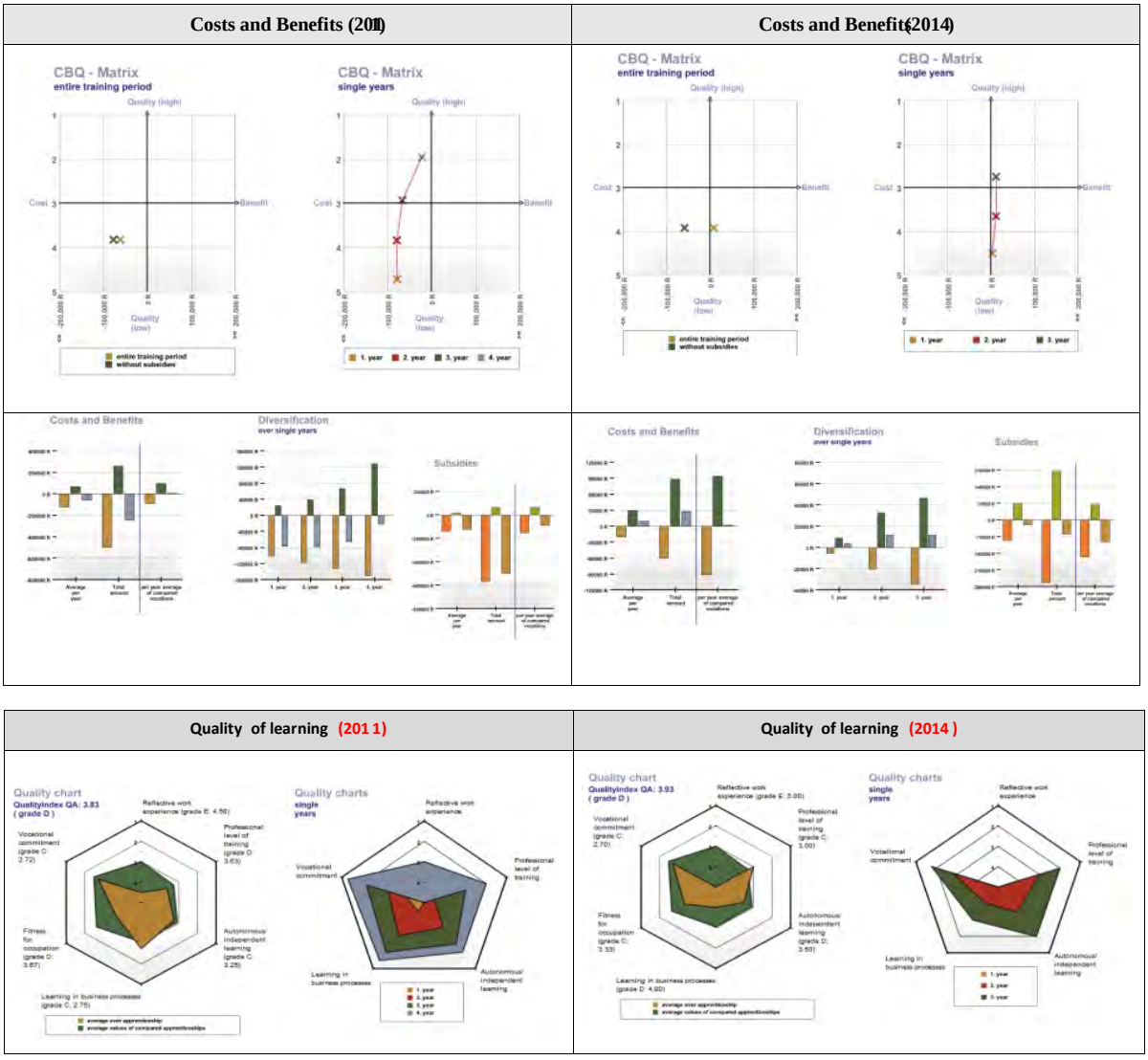


Figure 49: Cost-benefit and quality development within the project process. Individual company case (2) illustrating the potential of CBQ as an advisory tool.

Section 7: Summary and Recommendations

The CBQ project has collected data from more than 200 companies offering in-company training in South Africa, 142 of which had been approved as valid for benchmark purposes as well as for an overarching analysis, as documented in this report.

Among all individual companies assessed, there have been several best-practise cases, which can serve as good examples for other companies that engage or wish to engage in the provision of training capacities in in the near future. The majority of such examples of best practise have been found in small or medium sized companies–a fact that is supported by the overall analysis of all companies, where, on average, better or more favourable results were not achieved by large enterprises who have the means to run separate training workshops, but in an environment where the learners are more likely to be exposed to real business processes and where training on the job also implies a higher degree of independent or autonomous learning. It is thus interesting to note, that micro, small or medium sized companies often not only achieved better results in the cost-benefit section, but also in the quality analysis.

A key result of the present analysis is the fact that for the time being and, especially without any provision for subsidies, grants or the benefits from SARS tax allowances, only very few companies manage to offer in-company training in a cost-effective manner-or even achieve an equilibrium between costs and benefits. Less than 10% of all companies examined were in a position where such support was not needed in order to produce net benefits. Generally speaking, this was more likely in training courses with a longer duration–certainly due to the fact that the productivity of learners in their 3rd and 4th year of training was at more advanced levels so as to allow for greater benefits in times where training allowances are still much lower than skilled workers' wages.

However, the data analysis also revealed some great differences in the amounts paid for training allowances. In some companies these were close to the wages paid to skilled workers – a matter that needs to be more acknowledged when individual company situations are interpreted or consulting takes place in such areas.

Whatever the reasons were for costs exceeding the benefits in a single company case, the overarching analysis provided in this report delivers some useful hints that help explain such situations. Very often, this can be due to the involvement of (expensive) full-time trainers combined with training procedures which take place far away from the business as well as value added processes. When it comes to the question of how to shift the total costs of training to the medium-term perspective, the potential for cost reductions is greater.

Such a shift towards training practises with better involvement in business processes also has the power to positively change the overall level of training quality. This would be relevant for at least three out of four input criteria, notably "reflective work experience", "business process orientation", "independent learning", as well as to the two output criteria of training quality, provided the apprentice is working on tasks that are predominantly at a skilled work level.

On average, quality levels obtained were not good but still satisfactory, but with great differences between single training providers. Moreover the dispersion of results in some quality criteria was very high, so that apart from this general analysis it would be necessary to look at single values and their interplay in different company settings in order to draw an adequate conclusion. However, there is a very common conclusion that can be drawn from the analysis:

On average, companies only achieved higher quality levels in the final stages of training. This was a finding that had already been suspected after the initial test of the instrument in 2012, and can now be confirmed. As a consequence it would be good to further emphasise the development of training quality from the very beginning of an apprenticeship course.

Moreover, according to the according to the assessment of the data related to quality, training is not able to unlock its full potential, because there is a there is not enough of an understanding of professional, quality training. It is essential to raise the professional level of training and - in chorus – to promote business process orientation in training, which would have a stimulating effect on the learners' professional development as well as on their development of vocational identity and commitment.

Recommendations

1. Promoting the involvement of smaller and medium-sized businesses and exploring their potential in contributing to training the future workforce. Encouraging in-company training in "micro" businesses and in SMEs can be justified by the high quality potential of training opportunities in these businesses. In areas where there is no tradition of in-company training, a close cooperation with colleges can be a first step (for example internships).

2. Where full-time trainers are employed: linkage of workshop training to real job orders with the intention of increasing quality in reflective work experience on the one hand and to reduce the costs of training per apprentice and per year through a higher contribution of learners and full-time trainers to the business and thus value added processes on the other hand.

3. Reducing the support for short-term training courses, like 2-year courses of training. Companies offering such types of "training light" are not able to reach a positive cost-benefit balance without subsidies. This can only be achieved in apprenticeships with a longer duration (3 or 4 years). If support is offered after all, this support should be provided to companies offering a full course of training, when that training achieves higher levels of quality and better learning outcomes. This would be more beneficial to the South African economy in the long run.

4. Consideration should be given to adjustments in learners' training allowances towards a degree that does not exceed 35%-40 % of the wage levels of skilled workers in the final year of training. This implies supporting a VET policy, which focuses on transparency and fairness in the regulations of training allowances (at the moment and, according to the data provided by CBQ users, discrepancies seem to be very high).

5. In order to tackle the general problem of a low training quality on average for the first half of a training curriculum, regular team building between apprentices at different stages of their training and fully skilled workers can help. Moreover, it seems to be necessary to further increase the level of training with regard to business process orientation – especially in companies that include workshop training without or with only low ties to real work flows.

6. Cooperation among SME companies and/ or among “micro” businesses (sharing training opportunities, and shared use of training facilities) in order to reduce each individual company’s training costs while simultaneously providing a high quality of training (each company contributes those training components in which the company has specific expertise).

7. Stabilizing the availability of CBQ through chambers or institutions providing consultancy services. The implementation of CBQ as a consulting and advisory instrument could be part of an initiative supported by the government, i.e. through SETAS or chambers so that the instrument is free of charge for company members of all chambers promoting it.

8. Making the information on best-practise cases available to the public and strengthening the support in setting up training opportunities.

Summing up, the introduction of CBQ has provided individual company analysis and feedback in more than 200 cases so far. Apart from the benefits that individual employers might have had when receiving their CBQ data report and feedback, the complete database generated over the course of the project has also allowed for more wide-reaching conclusions. As for the anticipated outcomes of the project (Box 1, page 6) one can possibly conclude that the benefits for individual employers could be met and that the information from this analysis may serve to provide a basis for further decision-making in institutions involved in the future development of vocational education and training in South Africa, especially in terms of consultancy about the optimization of in-company training

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Appendix: Scatter plot diagrams

I Results according to vocations trained

Boilermaker

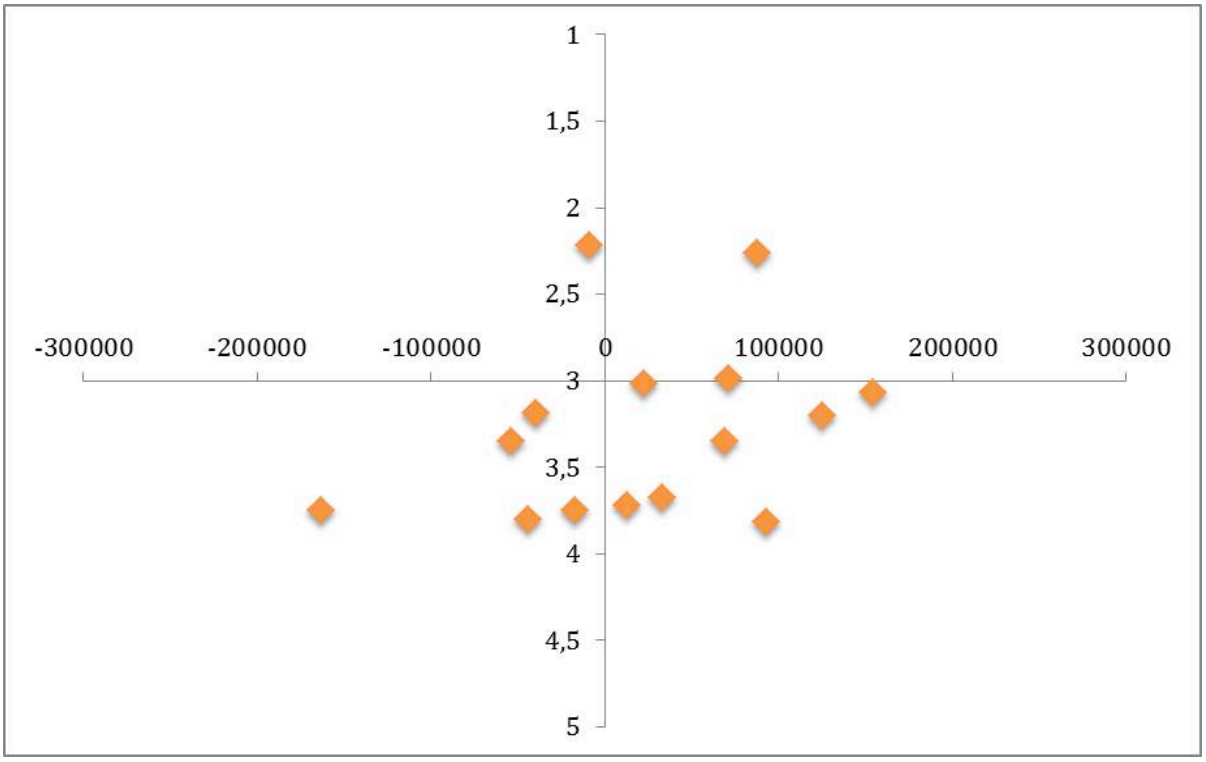

Figure 50: Dispersion of CBQ results of companies training boilermakers (n=17)

Diesel fitter & diesel mechanic

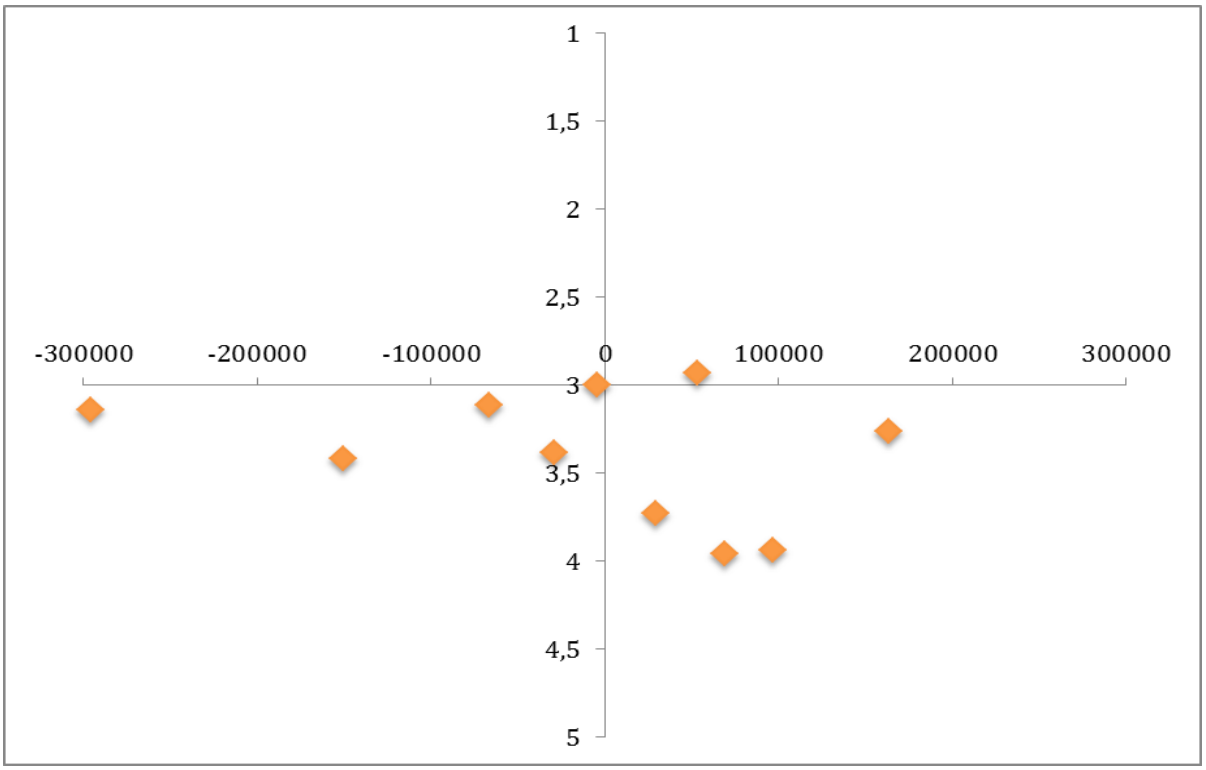

Figure 51: Dispersion of CBQ results of companies training diesel fitters or diesel mechanics (n=11)

Electricians

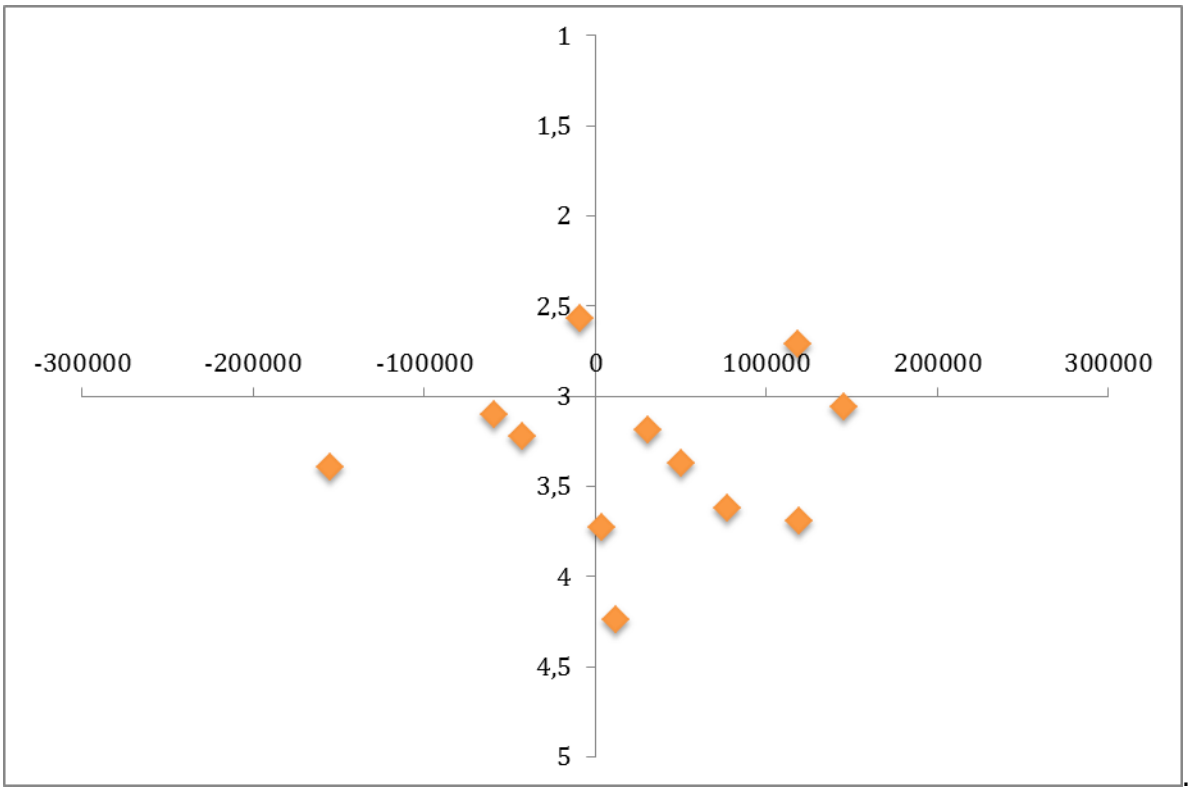

Figure 52: Dispersion of CBQ results of companies training electricians (n=13)

Fitter & Turner + fitter + turner

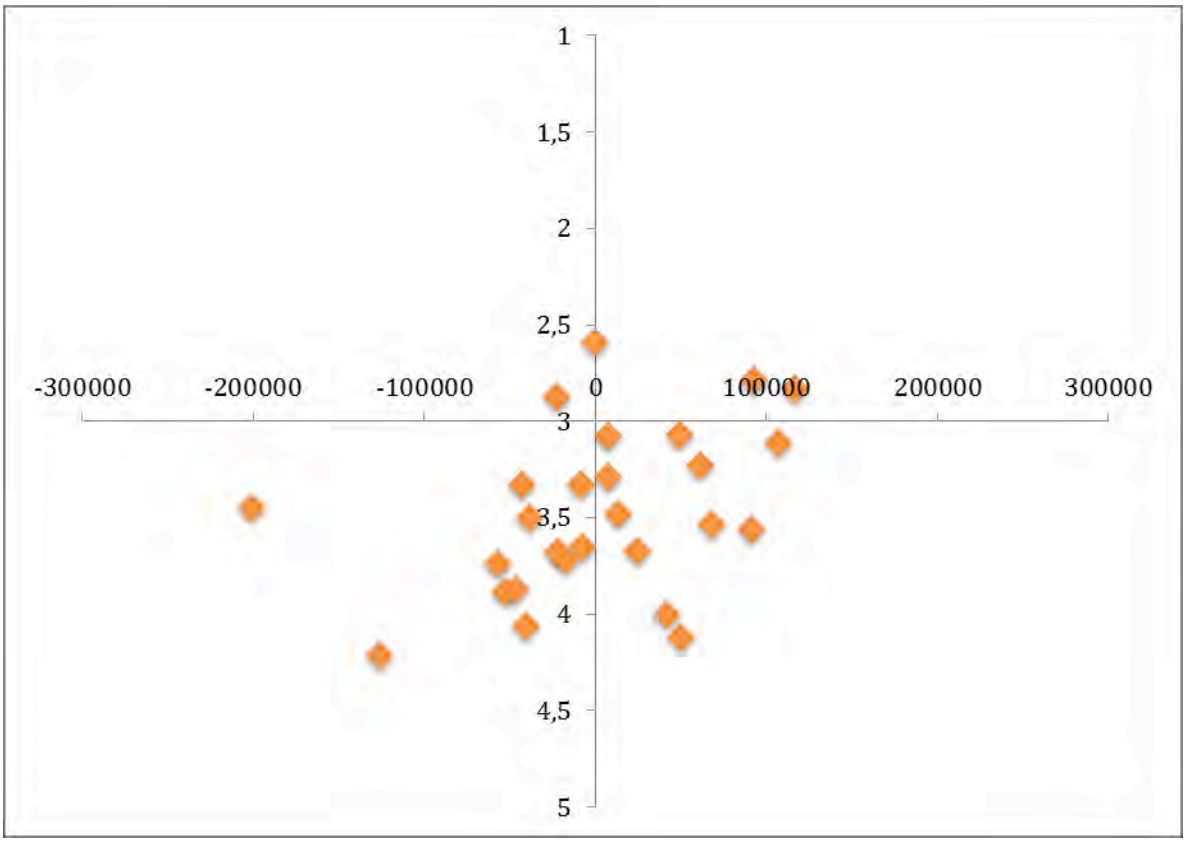

Figure 53: Dispersion of CBQ results of companies training fitters and turners, fitter, or turners (n=28)

Millwrights

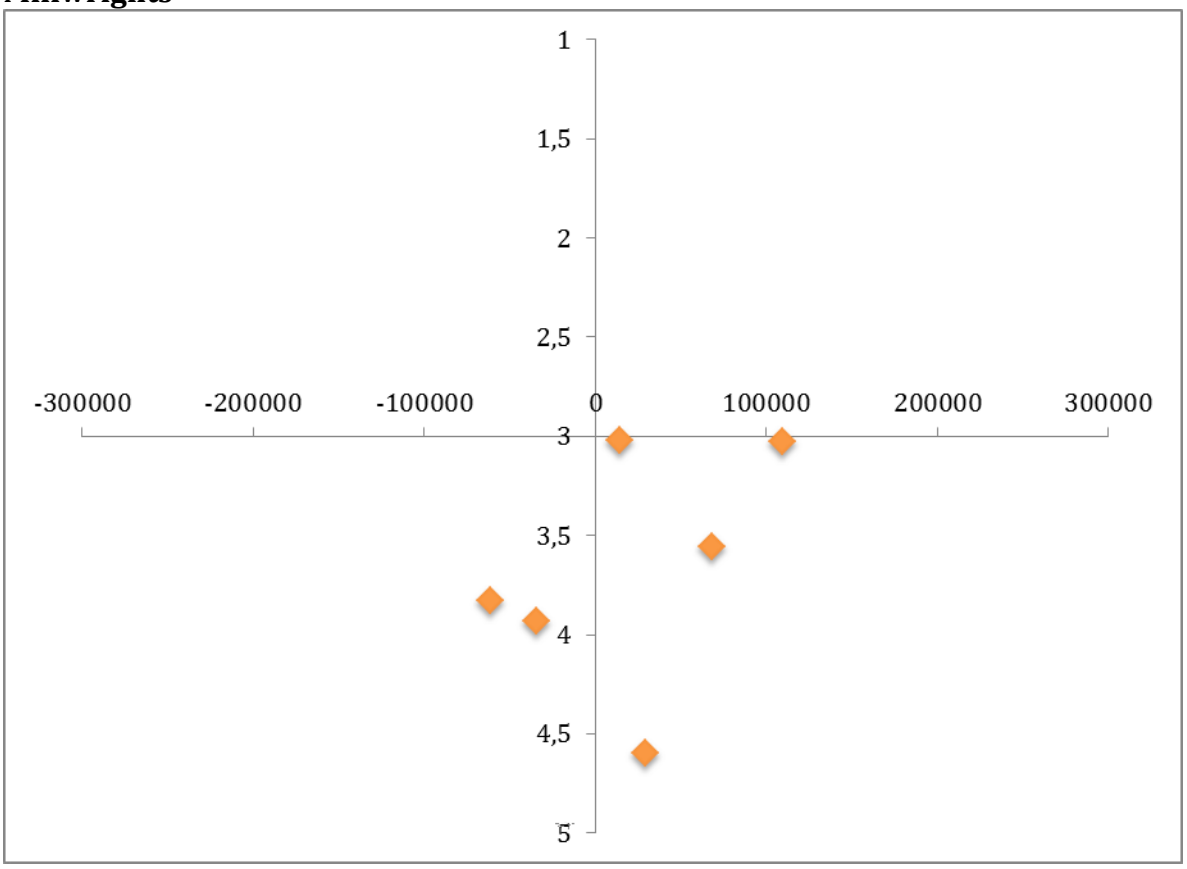

Figure 54: Dispersion of CBQ results of companies training millwrights (n=7)

Motor mechanics + Motor vehicle repair and maintenance

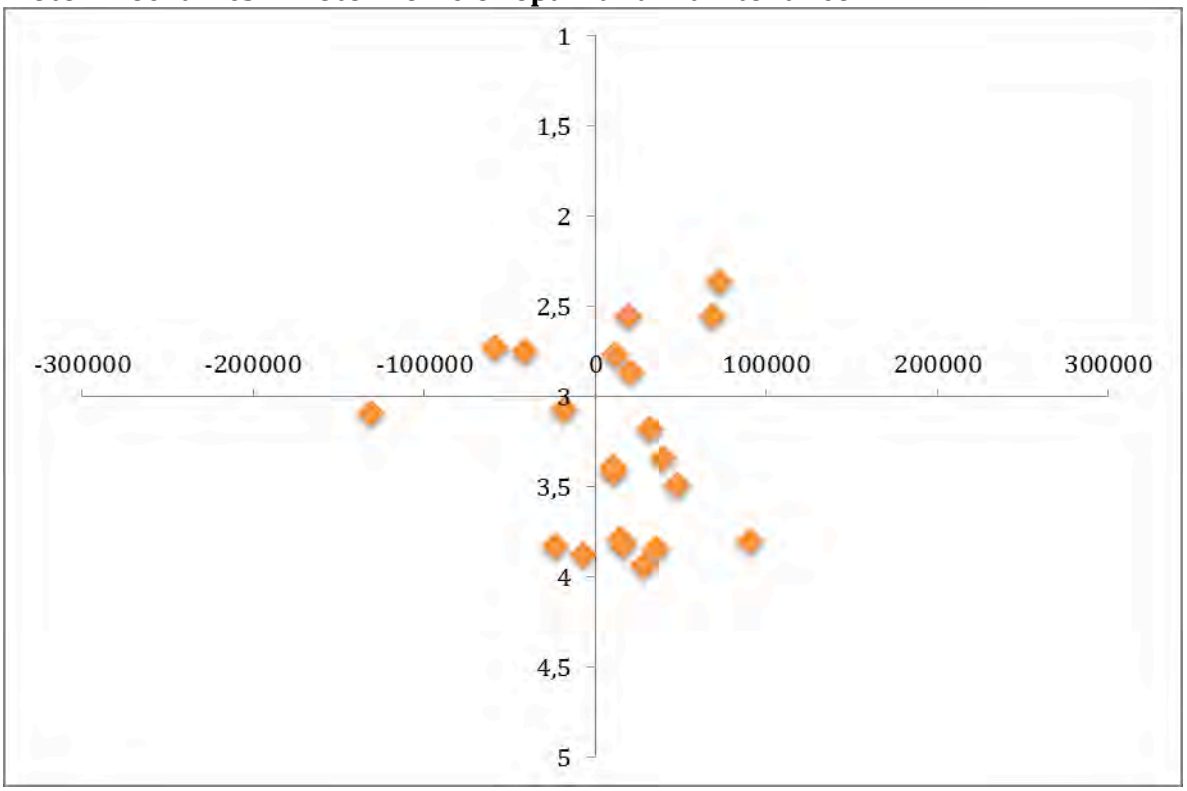

Figure 55: Dispersion of CBQ results of companies training motor mechanics or motor vehicle repair and maintenance professionals (n=21)

Tool jig and die maker

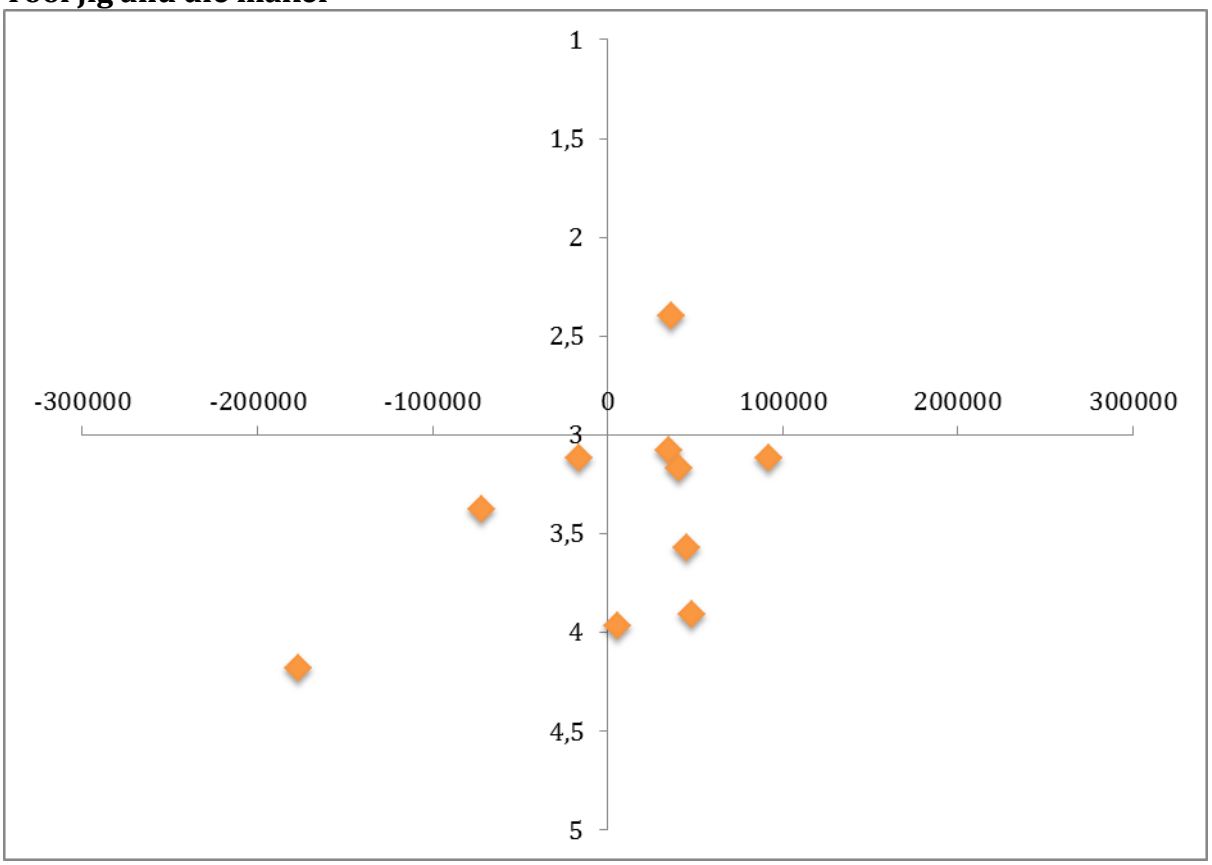

Figure 56: Dispersion of CBQ results of companies training tool jig and die makers (n=13)

Welder

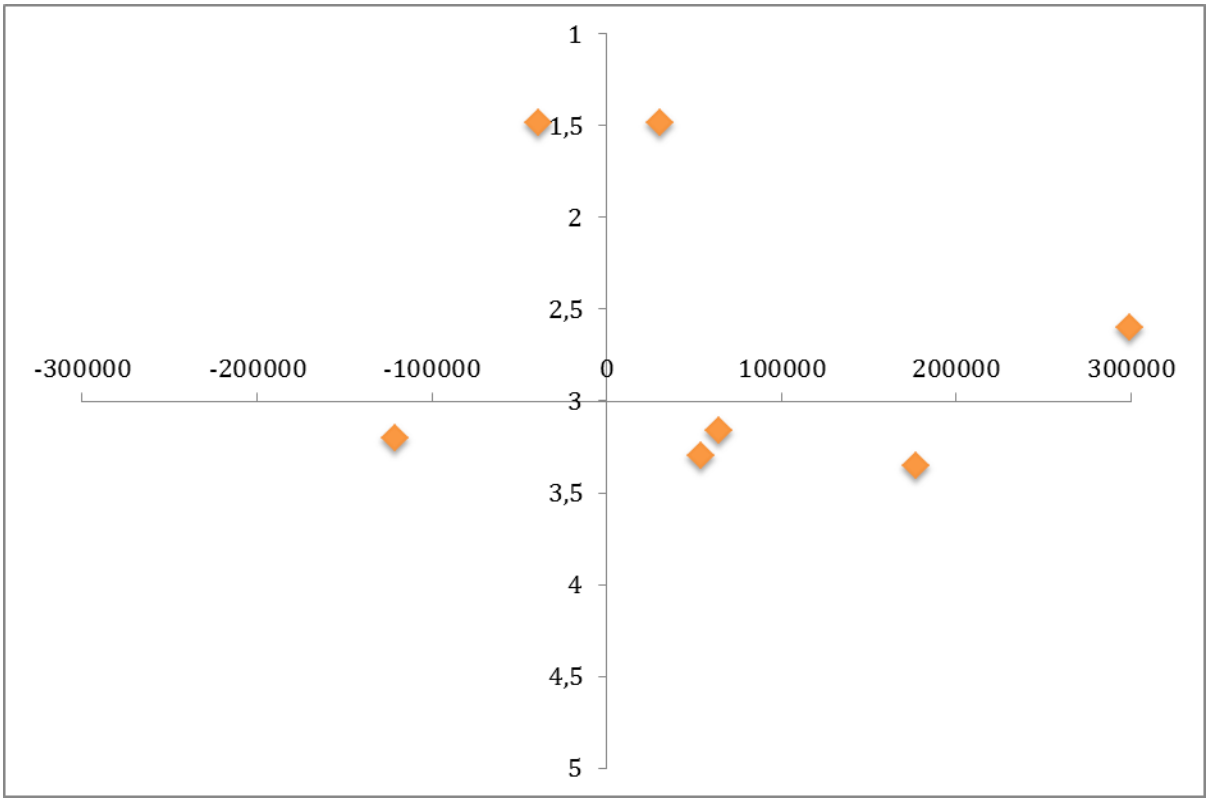

Figure 57: Dispersion of CBQ results of companies training welders (n=7)

II Results according to chambers of occupation

Auto

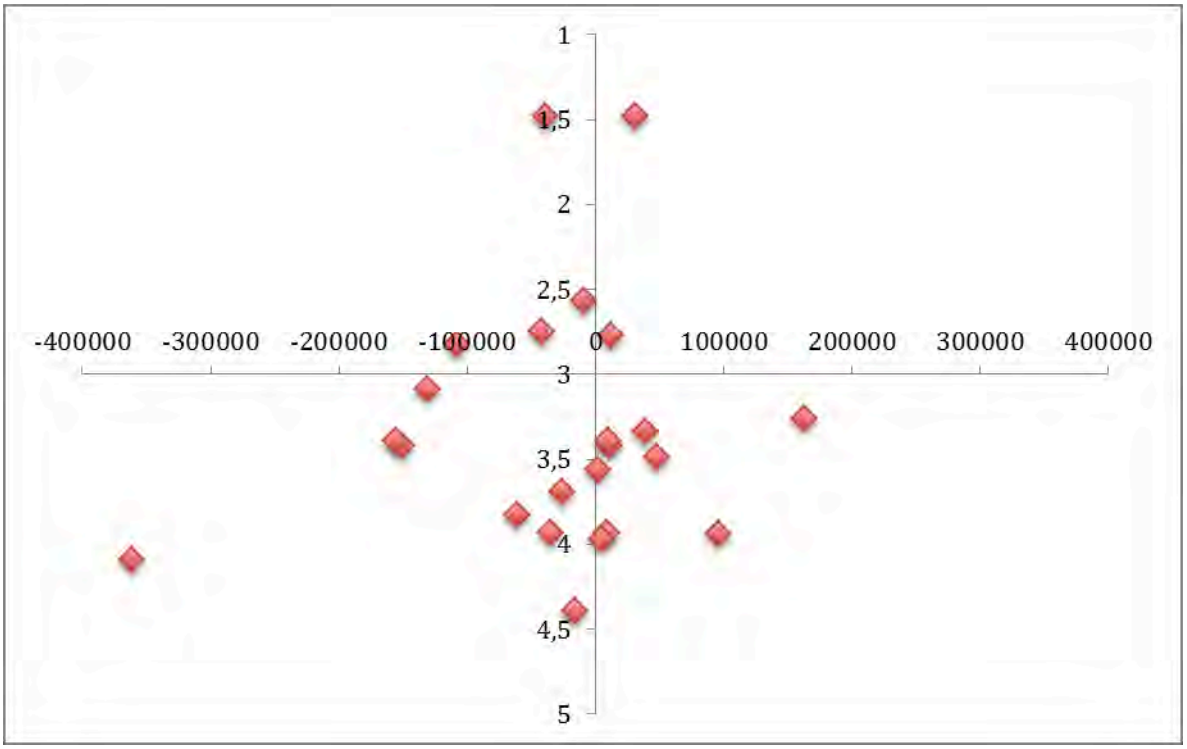

Figure 58: Dispersion of CBQ results of companies in the auto chamber (n=24)

Metal

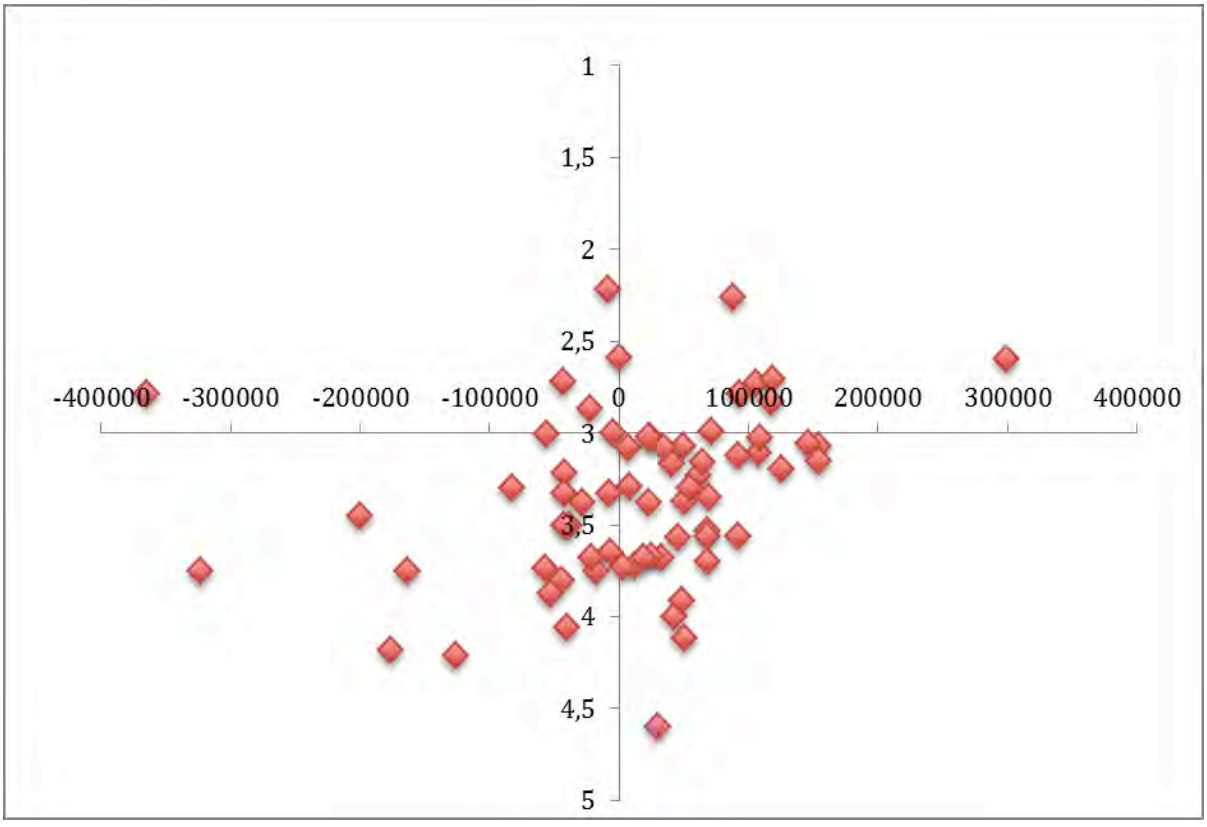

Figure 59: Dispersion of CBQ results of companies in the metal chamber (n=67)

Motor

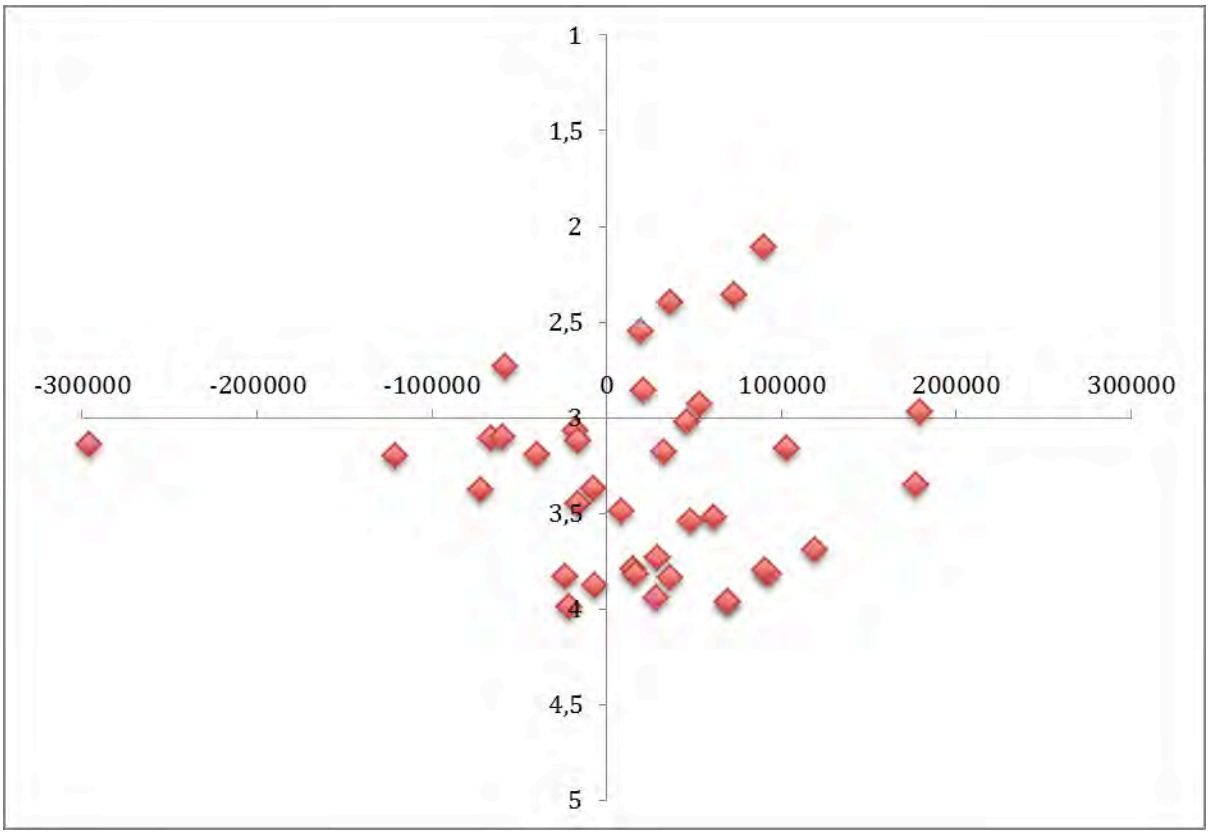

Figure 60: Dispersion of CBQ results of companies in the motor chamber (n=39)

New Tyre

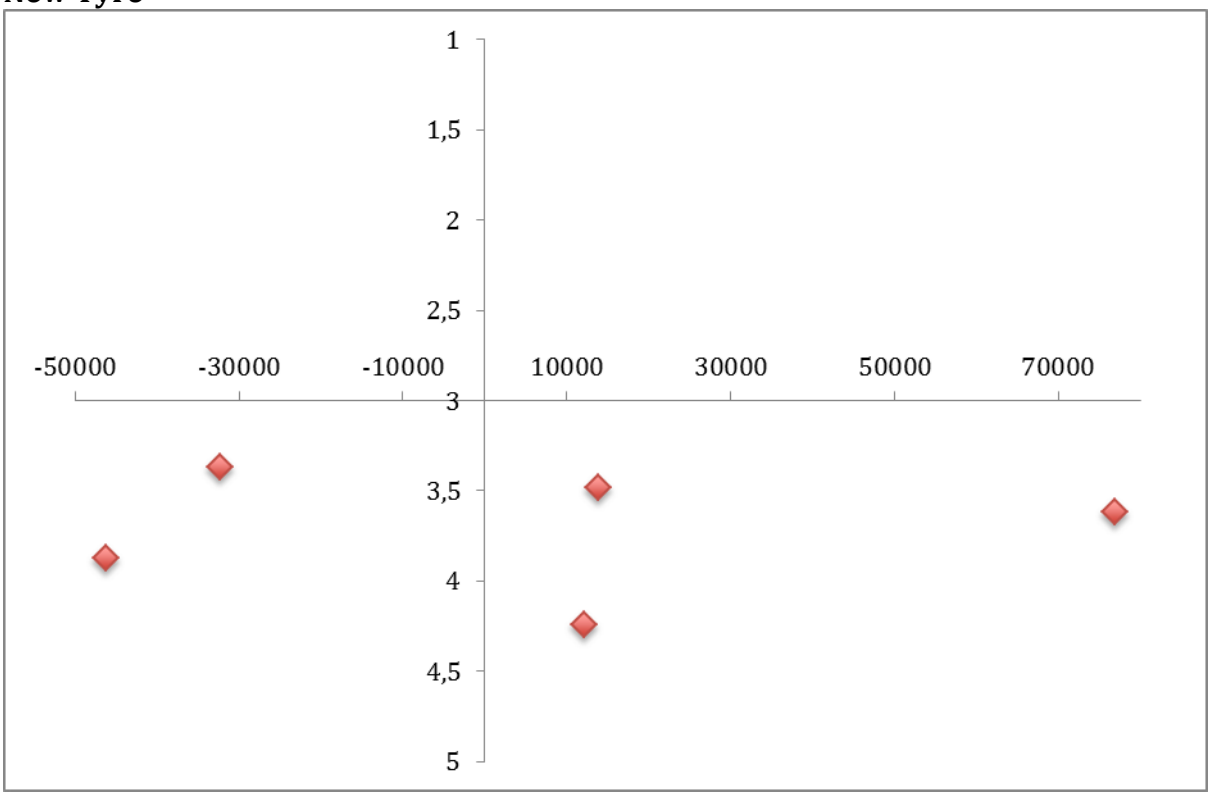

Figure 61: Dispersion of CBQ results of companies in the chamber of new tyre (n=5)