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Analyzing dropout intentions in vocational education and training: exploring the nexus between different dimensions of dropout reasons and the different directions of dropout intention

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Abstract

Extensive research has focused on various dimensions of dropout reasons, yet it often overlooks the importance of considering different dropout directions in the analysis. Our cross-sectional study examines the association of factors of six dimensions of dropout reasons (learner, professional, company, school, activity, and context) with four directions of dropout intention (upwards, downwards, horizontal: occupational change, and horizontal: company change). Stepwise regression analyses using dropout intention as a prior inner condition (before actual dropout behavior) with data from 559 industrial and office management trainees in Germany are conducted. Results indicate that the largest association across different directions of dropout intentions is exerted by the trainees' occupational identity (professional dimension) and the year in training (context dimension). School factors like the use of outdated teaching equipment and learner factors like trainees' high professional commitment predict upward dropouts, while a low level of trainees' workplace social involvement (activity dimension) predicts downward dropouts. Company factors like unfavourable working regulations predict occupational change, and a low level of trainees' functional involvement (activity dimension) predicts company change. Additionally, we confirm the previously found significant associations of activity and professional factors, particularly the cooperation between learning venues (school and training company) and the alignment between training and the desired occupation. The desired occupation predicts dropout intentions in the upward and horizontal direction (occupational change), and a low level of learning venue cooperation predicts the upward, horizontal (company change), and downward directions. To mitigate dropout rates, we recommend that vocational education and training stakeholders adopt preventive strategies by targeting specific directions of dropout intentions and the factors associated with the six dimensions of dropout reasons.

Keywords: Vocational education and training, Dropout, Dropout intention, Premature termination of contract, Industrial trainees, Office management trainees, Learning venue cooperation, Identity

Introduction

High dropout rates in Vocational Education and Training (VET) in numerous countries (CEDEFOP 2023) have been a major issue in education policy for years, mainly due to the increasing shortage of skilled workers and demographic changes (German Federal Statistical Office 2022). However, dropping out of training is also often a negative experience from an individual perspective. The high number of contract termination rates in the last years (e.g., in Germany, the contract termination rate fluctuated between 25.1 and 29.5% from 2016 to 2022; see Bundesinstitut für Berufsbildung 2024) underscores the importance of homing in on the dropout phenomenon.

Nevertheless, most national statistics do not hold information on VET students' subsequent paths after their dropout. This is problematic, since a broad, blanket approach treating dropout as a single variable might indicate higher rates but impede the understanding of particular reasons behind these rates. Effective management of dropouts on an organizational or systemic level requires comprehensive information on the type of dropout and the underlying reasons. However, in VET research, there is still a limited understanding of how dropout directions are influenced differently by various dropout reasons. This is surprising, since the few studies incorporating the dropout direction revealed that the reasons for dropping out varied depending on the dropout direction. Thus, it is essential to incorporate the dropout directions when analyzing dropout reasons.

Empirical evidence has shown that training quality (like social involvement, overload, feedback, and satisfaction with training) explains dropping out in favor of changing companies (Holtmann and Solga 2023; Krötz and Deutscher 2022), while the alignment between trainees and their occupation is a good predictor of changing VET occupation (Findeisen et al. 2024a; Holtmann and Solga 2023; Kirchknopf and Kögler 2022). The school leaving certificate is often seen as a valid indicator for predicting leaving the VET system without a qualification (in cases of a low school leaving certificate; see Michaelis and Richter 2022; Wydra-Somaggio 2021) or leaving the VET system to pursue higher education (in cases of a high school leaving certificate; see Krötz and Deutscher 2022; Ma et al. 2024). However, these studies are limited as they examine dropout reasons from specific dimensions (e.g., activity-related factors like social involvement, professional-related factors like alignment with desired occupation, learner-related factors such as satisfaction or school leaving certificate) rather than considering all potential reasons for dropping out. For example, dropout reasons related to environmental design factors at the learning sites (companies and VET schools) were largely neglected (Böhn and Deutscher 2022).

Once the reasons for the respective dropout direction have been identified, companies and educational practices can develop and implement more tailored measures to minimize dropout intention in the respective directions. Knowledge of the various dropout reasons depending on the dropout direction is also important, as the consequences of dropping out for society and trainees differ depending on whether the trainees remain in the dual system, switch to academic education, or even leave the VET system seeking unqualified work (for consequences on trainees' well-being see Michaelis and Findeisen 2023; for a reduction in tax revenues see Gambin and Hogarth 2016; for a loss of time see Findeisen et al. 2024a; for negative consequences in trainees' professional career,

income, and health see Schöngen 2003 and Stalder and Schmid 2006; for increased costs see Autorengruppe Bildungsberichterstattung 2010; Kropp et al. 2016; Schöngen 2003).

Against this backdrop, our study aims to expand upon the existing research on dropout in VET, specifically focusing on the research concerning dropout intentions. Building on the findings of Krötz and Deutscher (2022), who examined dropout factors that influence the four directions of dropout intention, we also seek to identify reasons behind various types of dropout intentions by incorporating additional factors of dropout reasons within the realms of company, VET schools, and context. We aim to investigate how factors of dropout reasons from six dimensions (*learner*, *professional*, *activity*, *company*, *school*, and *context*) may be related to four different directions of dropout intention (upwards, downwards, horizontal: occupational change, and horizontal: company change). For this purpose, we examine data from 559 industrial trainees and office management trainees from all 3 years of training in Germany. Despite comparatively low dropout rates for industrial trainees (11.9%, Bundesinstitut für Berufsbildung 2022a, 2024) and high dropout rates for office management trainees (28.3%, Bundesinstitut für Berufsbildung 2022b, 2024), we focus on these two training occupations because we are particularly interested in commercial training occupations involving office work and the chosen occupations are popular in this regard. Both occupations were among Germany's top 10 most common training occupations in 2022, reflected in the number of newly concluded training contracts (office management trainees: 22,530; industrial trainees: 15,390; German Federal Statistical Office 2023).

The paper is structured as follows: first, we establish the theoretical underpinnings of the concept of dropout intention, various directions of dropout intention, and potential dropout reasons. Subsequently, we provide an overview of the survey instrument used to assess the four directions of dropout intention and their related distinct factors across six dimensions of dropout reasons. In the main section, we examine the dropout reasons from the six dimensions for the four directions of dropout intention using regression analyses and pinpoint the most significant dropout reasons within each dimension for each dropout direction. Finally, we discuss the findings, their implications, and the study's limitations.

Defining dropout, dropout intention, and dropout directions in VET

The term dropout has a variety of meanings. Generally, dropout in VET is recognized as a gradual process influenced by various reasons (Jonker 2006; Lamamra and Masdonati 2008). Here, a crucial differentiation is the distinction between objectively measured dropout behavior at the end of the process and subjectively measured dropout intention along the process.

Dropout behavior is often captured through premature termination of contract, defined as apprenticeship contracts being terminated before the end of the training period (Uhly 2015). This means that cases in which the occupation and/or the company are changed are considered a dropout within this definition, even though individuals stay in the VET system (Uhly 2015). Other definitions subsume under dropout all cases in which trainees do not successfully achieve formal qualification before they leave the VET system completely (Uhly 2015; Schöngen 2003). This definition is, however, blind to switches of training occupations and training companies before individuals leave VET

systems. We suggest defining the term dropout more broadly *as quitting the VET training program prematurely due to a conglomerate of reasons*: Quitting may refer to quitting a training contract with a certain company (horizontal dropout: company change) or changing the VET program (horizontal dropout: occupational change). Such partial quitting may include changing the VET school in dual VET systems, but the VET school, in these cases, might also stay the same. This definition also includes quitting the VET system entirely, where learners quit (or are forced to quit) the training occupation, the training company, and the VET school. They then might take up an academic program (upward dropout) or end up in unqualified work or unemployment (downward dropout). This definition, therefore, accounts for all directions of dropout.

We relate to this definition by distinguishing four directions in the measurement approach taken in this study. However, since we conceive of dropout as a gradual process rather than a single event (Jonker 2006) that starts far earlier than the actual dropout decision or action, we measure dropout intention in the different directions described. While the tendency of dropout intention to overestimate future dropouts has been documented (Deuer and Wild 2017; Webb and Cotton 2018), we distinguish and capture dropout intention for the following reasons: (1) Dropout intention reflects an inner attitude and must primarily be considered as a latent stand-alone construct. Unlike actual dropout, it is informative on individual subjectivity and can explain how an individual develops the feeling or urge to drop out. However, this feeling is not synonymous with actual dropout behavior. (2) Examining dropout intention offers comprehensive insights into the influencing factors and their impact on dropout, recognizing that dropout often results from a combination of factors over an extended period (Jonker 2006; Lange 2020; Lamamra and Masdonati 2008). (3) Understanding trainees' dropout intentions enables practical training partners to develop strategies and interventions early in the dropout process, aiming to prevent trainee dropout (Deuer 2003).

The findings of various studies in diverse educational fields suggest a substantial positive relationship between dropout intention and actual dropout (for a summary, see Findeisen et al. 2024b), while there is little evidence in the VET field. For instance, in a study with Australian VET students, Fieger (2015) confirmed that the intention to complete training can be seen as a significant predictor of the probability of successfully completing the training. This was confirmed by a study by Samuel and Burger (2020), which found a significant positive relationship between the intention to drop out and the log-odds of actually dropping out among Swiss trainees. A positive (albeit weak) relationship between dropout intentions and future actual dropout for German cooks was also found by Findeisen et al. (2024b), while Findeisen et al. (2024a) confirm a medium-sized relationship for occupational change for Swiss vocational learners from diverse fields.

Given that dropout can stem from various reasons with diverse consequences, it is crucial to differentiate between different quitting patterns of partial or full dropout in VET to conduct a more nuanced analysis of the underlying reasons, as proposed by Krötz and Deutscher (2022). Their model of four dropout directions (Fig. 1) extends the conceptualization of Feß (1995) and Faßmann (1998), who differentiated between three dropout directions (upward, downward, horizontal). Upward dropout describes trainees who discontinue their training to pursue higher education outside the dual vocational

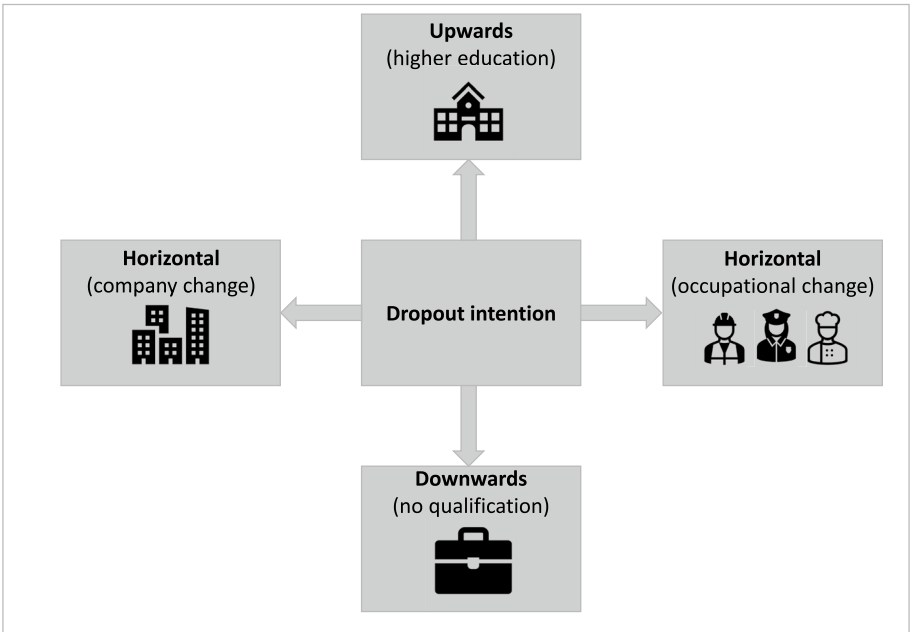

Fig. 1 Directions of dropout intention (adapted from Krötz and Deutscher 2022)

training system. This direction is also called a university stopout (Holtmann and Solga 2023). Dropping out downwards indicates that trainees drop out of training (and thereby the dual VET system) to work without qualifications or, in extreme cases, to become unemployed (Feß, 1995; Faßmann 1998). The horizontal direction of dropout is divided into a company change (trainees still work in their occupation) and an occupational change (trainees switch their training occupation). In both cases, trainees remain in the dual VET system. The horizontal dropout direction is also known as an occupational stopout or company stopout (Holtmann and Solga 2023; Wydra-Sommagio 2021).

Reasons for dropping out and dropout intention

The complex structure of dropout is also reflected in the variety of possible dropout reasons and their influencing factors. Böhn and Deutscher (2022) conducted a qualitative meta-synthesis to structure these various influencing factors of dropout and identified 666 potential dropout reasons from six dimensions (*learner*, *professional*, *company, school, activity,* and *context*, see Appendix, Fig. 4), thus confirming the multifaceted structure of dropout reasons. As the basis of their model, they used the structure of the 3-p-model of workplace learning by Tynjälä (2013) based on Biggs' (1999) distinction of input, process, and output categories. The input and process categories contain possible dropout reasons, while the output category represents the outcome of the interaction of the possible dropout reasons, i.e., premature termination of a contract. The input category of the framework model includes the dimensions of the (1) *learner,* (2) *professional,* (3) *company*, and (4) *school*. Dropout reasons belonging to the (5) *activity* dimension are assigned to the process category of the model, while factors of possible dropout reasons from the (6) *context* dimension have an overall influence beyond the 3-p-structure. Finally, the output category represents premature termination of contract as a possible (negative) outcome in VET.

1. For example, factors identified as dropout reasons belonging to the *learner* dimension are *gender*, *age*, *migrational background*, *educational level*, *self-assessment* of performance, and *competence*. Based on the results of their qualitative meta-synthesis, Böhn and Deutscher (2022) hypothesized that, opposed to gender per se, being employed in a *gender*-atypical occupation as a minority risk may heighten the dropout risk, though they did not consider different dropout directions for this assumption. Ma et al. (2024) empirically differentiated the four directions of dropout intention in a longitudinal study with industrial trainees from Germany. Their findings suggest a higher dropout intention in all four directions among *male* industrial trainees, who are the minority in this training occupation (42.4%). Wydra-Somaggio (2021) also examined diverse paths of German trainees in the VET system, thereby distinguishing between trainees who pursued new VET programs within the same occupation or switched to a different occupation (they are also called stopouts) and trainees who exited VET altogether. They found out that *women* are more likely to drop out or stop out with no change in occupation. Conversely, they are less likely to stop out with a change in occupation. Bessey and Backes-Gellner (2015) differentiated between dropping out downward (leaving the VET system) and changing or upgrading (meaning that trainees stay in the VET system). They examined trainees in the German VET system and found that *male* trainees enrolled in predominantly female occupations show a lower probability of upgrading than changing the occupation. Beckmann (2023) corroborated this finding in her study of German trainees in the dual VET system, revealing that *male* trainees in predominantly female occupations had a significantly higher likelihood of dropping out than their female peers. Although female trainees in predominantly male occupations also exhibited a higher dropout probability relative to their male peers, this effect was not statistically significant. As the study did not consider dropout directions, no conclusions can be drawn regarding the trajectories after the dropout. A further factor of this dimension is *age*. Ma et al. (2024) found that *age* showed a positive correlation with the intention to change companies and the intention to drop out upwards at the end of the training. Furthermore, the *migrational background* was also found to have an influence on dropout. Bessey and Backes-Gellner (2015) found that trainees with *non-German* parents were more likely to drop out downward. In addition, Ma et al. (2024) were able to show that trainees' *educational level* is positively correlated with the upward dropout intention during the first year of training. This finding is also in line with the finding of Bessey and Backes-Gellner (2015), who showed that trainees with a higher *educational level* are more likely to upgrade and less likely to drop out downward. The important role of the educational level as a factor of dropout reasons was also confirmed by Michaelis and Richter (2022) and Wydra-Somaggio (2021). Michaelis and Richter (2022) conducted a study on trajectories after premature contract terminations with trainees in Germany's dual or school-based VET system. Their research explored predictors of outcomes such as re-entries into VET, transitions to higher education, and outright dropouts from VET programs. However, nuances regarding re-entry into VET, including horizontal changes, were not fully explored. They found out that trainees' low *educational level* increased the probability of dropping out downward and withdrawing from VET. The findings of Wydra-Somaggio (2021)

corroborate this, showing that trainees with a lower *school leaving certificate* were more likely to drop out downward than those who changed occupations. In the study of Krötz and Deutscher (2022), German industrial trainees were examined regarding their dropout reasons, considering the four directions of dropout intentions. Their findings regarding trainees' *educational level* align with the findings of Ma et al. (2024) that a high educational level increases trainees' intentions to drop out upward. Moreover, trainees' *self-assessment* of their performance during the apprenticeship can also be a factor in the process of dropping out. In their study, Findeisen et al. (2024a) distinguished different predictors for change of occupations and change of companies as two types of premature contract termination. Their sample consisted of Swiss trainees in the dual VET system, and they were able to show that trainees' *self-assessment* of work performance negatively affects actual occupational and company changes. The findings of Findeisen et al. (2024a) align with those of Krötz and Deutscher (2022) that the better the trainees could *self-assess* their training performance, the lower their intention to change their occupation. Lastly, trainees' *competence*, specifically domain-specific competence, can be a significant dropout reason. While domain-specific *competence* at the beginning of the training correlates negatively with the intention to drop out downward after the first and the final year of training and with the intention to change occupations in the final year of training, domain-specific *competence* at the second half of the training correlates negatively with the intention to drop out downward after the first year of training (Ma et al. 2024). Furthermore, a higher domain-linked *competence* at the beginning of the training is associated with a higher intention to drop out upward after the first year of training (Ma et al. 2024).

2. Factors associated with dropout reasons belonging to the *professional* dimension are, for example, *occupational* and *organizational identity* and alignment with the *desired occupation*. Kirchknopf and Kögler (2022) examined the influence of *occupational* and *organizational identity* on the intention to drop out in favor of changing companies and changing occupations (both horizontal directions). They examined German automotive management trainees, industrial trainees, and office management trainees and found that trainees with a higher *occupational identity* showed a lower dropout intention regarding changing companies and changing occupations. This also applies to *organizational identity*: higher values are associated with a lower intention to change companies and change occupations. Maué et al. (2023) also examined the influence of *organizational identity* on trainees' dropout intention. They examined German trainees in the dual VET system and showed that *organizational identity* has a negative effect on dropout intention. However, they did not consider the directions of dropout intentions. Various studies have highlighted the important role of aligning the training occupation with the *desired occupation* as a dropout reason when considering the directions of dropout intention. Ma et al. (2024) showed that trainees trained in their *desired occupation* show a lower dropout intention in all four directions during their first and final year of training. Holtmann and Solga (2023) also differentiated between German trainees in the dual or school-based VET system who dropped out of VET and those who pursued occupational changes (occupational stopouts), company switches (company stopouts), or higher education enrollment

post-contract termination (university stopouts). Their findings highlighted that the *desired occupation* decreases the risk of a downward dropout and occupational and university stopouts. Michaelis and Richter (2022) could only show this probability for the downward dropout direction. Regarding dropout intentions, Findeisen et al. (2024a) showed that occupational changes are negatively predicted by the *desired occupation*, but the *desired occupation* showed no significant effect on actual occupational changes. Their findings align with the results of Krötz and Deutscher (2022), who also found a negative relation between *desired occupation* and trainees' intention to change the occupation.

3. The *company* dimension includes factors such as *company size*, *working hours***,** and *learning conditions* as dropout reasons. Regarding the factor of *company size*, Wydra-Somaggio (2021) found that working in a company with less than 250 employees decreases the probability of a downward dropout. Rohrbach-Schmidt and Uhly (2015) confirmed the higher risk of contract termination in *small companies*. However, their study with German trainees did not distinguish between the different dropout directions. Another factor associated with dropout is *the working hours regulation*. Several studies examining the reasons for dropout among German trainees in the dual VET system have identified unfavorable *working hours* such as frequent overtime, consistently exceeding the usual working hours, and irregular work schedules as potential dropout reasons (Schuster 2016; Greilinger 2013; Ernst and Spevacek 2012). However, these studies do not account for the different dropout directions. Finally, the *learning conditions* at the training company appear to play a role in the dropout process. Greilinger (2013) and Ernst and Spevacek (2012) found that trainees frequently cite insufficient training content and the perception of inadequate instruction as key reasons for their decision to drop out.
4. Possible factors of dropout reasons mentioned by trainees that belong to the *school* dimension are poor and outdated *school equipment* (e.g., technical devices, textbooks) and *conflicts with teachers* and *with other trainees* (Schuster 2016; Ernst and Spevacek 2012).
5. Factors associated with dropout reasons belonging to the *activity* dimension include *social involvement*, *complexity of tasks*, *overload*, *non-training activities*, *feedback*, and *mentoring*. Regarding the influence of *social involvement* on dropout intention, Maué et al. (2023) found that dropout intention is negatively related to trainees' *social involvement*, which corroborates Krötz and Deutscher's (2022) finding that trainees' high *social involvement* decreases the intention to drop out in all four directions. Krötz and Deutscher (2022) also showed that *task complexity*, *overload*, *non-training activities, feedback*, and *mentoring* are significant factors of dropout reasons: a high *task complexity* increases trainees' intention to drop out upward and change their occupation; work *overload* increases the intention to change occupations and companies and to drop out upward; the more trainees must perform *non-training tasks*, the higher their intention to change companies; the more trainees receive *feedback* and experience *mentoring*, the lower their intention to change companies.
6. The *context* dimension contains factors such as *training occupation* and *years in training* as dropout reasons. Rohrbach-Schmidt and Uhly (2015) emphasized the role of the *training occupation* as a factor of dropout reasons in explaining the risk of

contract terminations. They found that the risk of contract termination varies significantly between *training occupations*. Regarding the *years in training*, Laporte and Mueller (2011) found that Canadian trainees tend to drop out at an earlier stage in their apprenticeship. However, they did not consider the dropout directions when analyzing dropout reasons.

Overall, these studies on the association of different dropout reasons regarding the directions suggest that specific reasons for dropout depend on the direction of leaving. While some dropout reasons, such as desired occupation and trainees' social involvement, affect all four directions of dropout intention (Ma et al. 2024; Krötz and Deutscher 2022), other dropout reasons, such as trainees' self-assessment of their performance, only affect the direction of occupational change (Findeisen et al. 2024a; Krötz and Deutscher 2022). As we have shown above, several studies have already distinguished different dropout directions when analyzing dropout reasons. However, these focus mainly on dropout reasons belonging to the *learner*, *professional*, and *activity* dimensions, while there is a lack of studies focusing on dropout reasons belonging to the *company*, *school*, and *context* dimensions when considering the dropout directions. We only found one study that examines the relationship between company size (as a dropout reason belonging to the *company* dimension) and the dropout directions (see Wydra-Somaggio 2021). Furthermore, mostly due to data restrictions, not all studies (even those that consider the dropout direction) consider all four dropout directions or all possible dropout reasons from the six dimensions.

To generate more differentiated results in this area of dropout research, we consider possible factors of dropout reasons from all six dimensions in our study, thereby expanding the current understanding of how different dropout directions are associated with different dropout reasons. Based on these considerations, we formulate the following two research questions:

RQ1: Do the six dimensions of dropout reasons and the different directions of dropout intention show an association?
RQ2: Which distinct factors of the six dimensions of dropout reasons are associated with each direction of dropout intention?

Method

Context of the study

We were interested in analyzing dropout reasons considering the directions of dropout intention of German industrial and office management trainees. VET programs in these two occupations in Germany are organized as dual programs, providing a pathway for a successful transition into work. Training is divided between the training company and the vocational schools in dual programs. The training companies are responsible for the practical component, integrating trainees into typical work processes and tasks of the occupation. In contrast, vocational schools handle the theoretical component, providing knowledge transfer in a classroom setting. Vocational school lessons can be structured either as block lessons, where trainees attend vocational school exclusively for several

weeks or months, or as weekly lessons, usually 1½ days per week, alongside in-company training. The training duration for both occupations is generally 3 years. No specific school-leaving certificate is required, allowing a range of trainees from those with a lower secondary school certificate (Hauptschulabschluss) to those with a general higher education certificate (Allgemeine Hochschulreife).

Data collection and sample

Data were systematically gathered between January and May 2022 at 19 randomly selected vocational schools in Baden-Wuerttemberg, a federal state of Germany. We conducted a cross-sectional study and collected data from industrial and office management trainees across all 3 years of their respective apprenticeships.

During 135 min of data collection, trainees were asked to solve a performance test by computer within a virtual office simulation and fill out a questionnaire regarding dropout intentions and dropout reasons. The office simulation represented a commercial workplace with typical office tools (e.g., mail program, spreadsheet software, notepad, word processor, calculator, PDF viewer, chat, enterprise resource planning software, encyclopedia, and intranet) where learners could work on authentic tasks. The trainees had time to familiarize themselves with the simulation to ensure they could cope with the test environment.

During the performance test, the trainees were asked to work on a professional task (supplier selection/utility analysis) which evaluated their competence. While solving the task, the trainees systematically evaluated potential suppliers using a spreadsheet program and wrote a short note to a fictitious supervisor about which supplier they had chosen. Utility analysis is a common method for evaluating and making decisions under complex conditions. It involves comparing alternatives based on objective criteria and selecting the one with the highest score. The supplier selection task was embedded in a fictitious authentic model company, where participants took on the role of new trainees at the model company (see Appendix, Fig. 5). It was validated by students of economic and business education, teachers at vocational schools, and commercial trainees (see Gentner et al. 2022). The competence score, as the sum of the points achieved within the supplier selection task, assessed the competence of each trainee and is included as the factor of *trainees' competence* belonging to the *learner* dimension (one of the 65 items of dropout reasons) in the further analyses in addition to the short scales of the questionnaire.

Besides the performance test, trainees were asked to work on a questionnaire consisting of questions on the directions of dropout intention (4 items), general dropout intention (1 item), dropout reasons (64 items of a total of 65 dropout reasons), and sociodemographic information. Questions regarding the dropout reasons were derived from the VET-LQI questionnaire by Böhn and Deutscher (2021) (all items of the VET-LQI questionnaire can be found at Deutscher et al. 2023) and further questions by Krötz and Deutscher (2022). However, our questionnaire used short scales and single-item measures to give a broader view of the six dropout dimensions, limiting the testing time per construct. All short scales and single-item measures can be assigned to the six dimensions: (1) *learner*, (2) *professional*, (3) *company*, (4) *school*, (5) *activity*, and (6) *context* of the framework model by Böhn and Deutscher (2022), reflecting the factors of dropout

reasons and thus forming the basis of our analyses (see Appendix, Fig. 4). Table 1 gives an overview of the measured constructs, the survey instruments, and the central scale characteristics.

The performance test and questionnaire were conducted anonymously. We were able to match the data of $n = 597$ trainees. In a further step, trainees who had already completed an apprenticeship were excluded from the analysis. This was done to reduce biased results as we assumed that their intentions to complete the apprenticeship would differ due to the security provided by completing a prior apprenticeship, in contrast to the intentions of trainees without a completed apprenticeship. This exclusion reduced the sample size by 38 trainees, resulting in a total of $n = 559$ trainees. The distribution of the trainees across occupations and the year in training is illustrated in Table 2.

Of the trainees, 71.2% were female, which closely aligns with the gender distribution (70.2% female) among newly signed training contracts for office management trainees in 2022 (Bundesinstitut für Berufsbildung 2022b). However, this proportion is notably higher than that among industrial trainees (53.4% female; Bundesinstitut für Berufsbildung 2022a). The average age was 21.2 years and ranged from 17 to 40 years. This is closer to the average age of office management trainees (20.7 years, ranging from under 16 to over 40 years; Bundesinstitut für Berufsbildung 2022b) than that of industrial trainees (19.7 years, ranging from under 16 to over 40 years; Bundesinstitut für Berufsbildung 2022a). A total of 62.9% of the trainees held the highest school-leaving certificates (either an advanced technical college certificate or a general higher education certificate), aligning with the average for industrial trainees (64.2%; Bundesinstitut für Berufsbildung 2022a). This percentage is substantially higher than the average for office management trainees (36.2%; Bundesinstitut für Berufsbildung 2022b). Most trainees spoke only German at home (62.9%), slightly more than a third spoke additional languages alongside German (34.4%), and a fraction only spoke a foreign language at home (2.7%). Further descriptive data on additional sample characteristics and the frequency of the different directions of dropout intentions[1] are presented in Table 1 and Tables 8, 9, 10 in Appendix.

Analyses

To get a first overview of relations between all dependent and independent variables, we calculated correlation analyses (see Tables 11 to 16 of the additional files) and checked for multicollinearity within our included data. Multicollinearity with a Variance Inflation Factor (VIF) of < 2.317 was no issue in the analysis (Hair et al. 2014).

To answer the first research question (RQ1) concerning the association of the six dimensions of dropout reasons with each direction of dropout intention, we conducted a blockwise regression analysis, including all 51 significant variables identified in the correlation analysis. We estimated a global model with six blocks of variables using linear regression for each of the four directions of dropout intention. Each of the six dimensions of the model of dropout reasons (Böhn and Deutscher 2022) forms one block

[1] Three trainees exhibited high levels of both upward and downward dropout intentions. All three trainees scored highly on the general dropout intention item and two trainees also showed high values regarding the horizontal directions. We included such contradictory cases because trainees can concurrently have multiple dropout intentions before deciding to drop out in a particular direction (or decide not to drop out and finish the apprenticeship).

Table 1 Overview of measured constructs, scales, and items

Measured construct	Test/survey instrument and items	Range	M	SD	Cronbach's α (if applicable)
Learner dimension (input category)					
Educational level (biography)	*Educational level: My highest school-leaving certificate is…	1 = Lower secondary school certificate (Hauptschulabschluss), 2 = Secondary school certificate (Mittlere Reife), 3 = Advanced technical college (Fachhoch-schulreife), 4 = General higher education certificate (allgemeine Hochschulreife/Abitur)	2.92	0.851	Single item
Grade (biography)	Grade: What was the average grade in your final school leaving certificate you attended?	1 = 1.0–1.5, 2 = 1.6–2.0, 3 = 2.1–2.5, 4 = 2.6–3.0, 5 = 3.1–3.5, 6 = 3.6–4.0, 7 = > 4.0	3.27	1.147	Single item
Terminated training before (biography)	Terminated training before: I have already terminated vocational training	0 = no terminated training before, 1 = terminated training before in a commercial, industrial, social, or other field	0.13	0.342	Single item
Age (demographic details)	*Age: Age of the trainees	Free-text answer	21.20	2.836	Single item
Gender (demographic details)	*Gender: What gender do you belong to?	0 = female, 1 = male	0.29	0.453	Single item
Migrational background (demographic details)	*Languages (spoken at home): In my family I speak …	1 = only German, 2 = more than German, 3 = only other than German	1.40	0.542	Single item
Highest level of parental occupation (demographic details)	*Occupational qualification of father: What occupational qualification does your father have? None	0 = father has training or higher education, 1 = father has no occupational qualification	0.08	0.272	Single item
	*Occupational qualification of father: What occupational qualification does your father have? Training	0 = father has no occupational qualification or a higher education, 1 = father has a training	0.60	0.489	Single item
	*Occupational qualification of father: What occupational qualification does your father have? Higher education	0 = father has no occupational qualification or a training, 1 = father has higher education	0.19	0.394	Single item
Self-assessment of training performance (personal details)	*Self-assessment of training performance (self-assessed grade): How would you rate your overall performance during your vocational training?	1 = 1.0–1.5, 2 = 1.6–2.0, 3 = 2.1–2.5, 4 = 2.6–3.0, 5 = 3.1–3.5, 6 = 3.6–4.0, 7 = > 4.0	2.60	1.124	Single item

Table 1 (continued)

Measured construct	Test/survey instrument and items	Range	M	SD	Cronbach's α (if applicable)
Motivation (personal details)	*Aspired final grad: What final grade are you aiming for/would you like to achieve?	1 = 1.0–1.5, 2 = 1.6–2.0, 3 = 2.1–2.5, 4 = 2.6–3.0, 5 = 3.1–3.5, 6 = 3.6–4.0, 7 = > 4.0	2.02	0.859	Single item
Professional commitment (personal details)	Professional commitment: I am diligent at work (Krötz and Deutscher 2022)	1 does not apply at all to 5 completely applies	4.46	0.735	Single item
	Professional commitment: Compared to my classmates, I tend to have a lot of absences[r] (Krötz and Deutscher 2022)	1 does not apply at all to 5 completely applies	4.33	1.034	Single item
	*Professional commitment: I am happy to take on responsibility (Krötz and Deutscher 2022)	1 does not apply at all to 5 completely applies	4.05	.886	single item
	*Professional commitment: I often have the feeling that I have little influence over what happens to me[r] (Krötz and Deutscher 2022)	1 does not apply at all to 5 completely applies	3.64	1.053	Single item
Trainees' interests (personal details)	*General interests: My interest in the following topics is … … German	1 no interest at all to 5 very high interest	3.16	1.010	Single item
	General interests: My interest in the following topics is … … Mathematics	1 no interest at all to 5 very high interest	2.70	1.179	Single item
	*General interests: My interest in the following topics is … … Accounting	1 no interest at all to 5 very high interest	3.38	1.085	Single item
	*General interests: My interest in the following topics is … … Organization of projects and work processes	1 no interest at all to 5 very high interest	4.07	0.957	Single item

Table 1 (continued)

Measured construct	Test/survey instrument and items	Range	M	SD	Cronbach's α (if applicable)
Trainees' competence (competence level)	*Competency score (sum score) within supplier selection task	Competence score of all trainees ranged from 1.8 points to 75.1 points	46.59	16.996	Single item
Professional dimension (input category)					
Desired occupation (professional identity)	*Desired occupation: My training occupation was my desired occupation at the time I chose my occupation (Krötz and Deutscher 2022)	1 strongly disagree to 5 completely agree	3.44	1.194	Single item
Occupational identity (professional identity)	*Occupational identity: I like telling others about my skilled occupation (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	3.68	1.104	Single item
Organizational identity (professional identity)	*Organizational identity: I like telling others about my training company (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	3.74	1.208	Single item
Company dimension (input category)					
Company size (working conditions)	*Company size How many employees (including trainees) does your company have?	1 = 1–5, 2 = 6–10, 3 = 11–20, 4 = 21–50, 5 = 51–100, 6 = 101–250, 7 = 251–500, 8 = 501–1000, 9 = more than 1000	5.86	2.124	Single item
Overtime (working conditions)	Overtime: I regularly work overtime	1 strongly disagree to 5 completely agree	3.11	1.348	Single item
Trainees' availability (working conditions)	*Availability outside working hours: I also have to be available outside my working hours	1 strongly disagree to 5 completely agree	1.43	0.815	Single item
Spare time (working conditions)	*Spare time: I hardly have any free time due to my training	1 strongly disagree to 5 completely agree	2.34	1.252	Single item
Work climate (working conditions)	*Work climate: There is a bad working atmosphere within my company[r] (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	4.04	1.077	Single item

Table 1 (continued)

Measured construct	Test/survey instrument and items	Range	M	SD	Cronbach's α (if applicable)
Learning opportunities (learning conditions)	*Learning opportunities (didactic diversity): Workplace learning in my company is characterized by different teaching methods (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	3.02	1.126	Single item
	*Learning opportunities (completeness) • I am taught all the important training content during my apprenticeship • I am instructed in work processes	1 strongly disagree to 5 completely agree	4.15	0.899	α = 0.77
School dimension (input category)					
Relationship with teachers (learning climate)	*Relationship with teachers • My teachers explain well • I like my teachers • My teachers want the best for me • My teachers always support me • I can ask my teachers anything • I feel supported by my teachers when I have personal problems as well (Krötz and Deutscher 2022)	1 strongly disagree to 5 completely agree	3.65	0.830	α = 0.92
Relationship with other trainees (learning climate)	*Relationship with other trainees • I feel that I can always ask my classmates if I have any questions • If I can't cope in class, I get help from my classmates • I have the feeling that I am an important member of my class • I feel comfortable in my class (Krötz and Deutscher 2022)	1 strongly disagree to 5 completely agree	3.96	0.867	α = 0.88

Table 1 (continued)

Measured construct	Test/survey instrument and items	Range	M	SD	Cronbach's α (if applicable)
School learning content (learning conditions)	*Learning content • All of the important commercial foundations are taught in the classroom • The school also teaches specialist knowledge that I need in the company • At school, my practical work from the company was consolidated through background information • In the course of learning in vocational school, I can network knowledge from different subjects • In class, I understand how the content relates to operational practice (Krötz and Deutscher 2022)	1 strongly disagree to 5 completely agree	3.46	0.751	α = 0.83
Satisfaction with digitization of schools (learning conditions)	*Satisfaction with digitization I am very satisfied with the digitalization at my vocational school	1 strongly disagree to 5 completely agree	3.31	1.176	Single item
School equipment (learning conditions)	School equipment The following equipment is available at my school: Network connection for your own laptop	0 yes, 1 no	0.43	0.496	Single item
	School equipment The following equipment is available at my school: Mobile devices are provided	0 yes, 1 no	0.46	0.499	Single item
	*School equipment The following equipment is available at my school: Web-based learning platform	0 yes, 1 no	0.72	0.451	Single item
	School equipment The following equipment is available at my school: Well-functioning wifi	0 yes, 1 no	0.66	0.475	Single item

Table 1 (continued)

Measured construct	Test/survey instrument and items	Range	M	SD	Cronbach's α (if applicable)
Use of school equipment (learning conditions)	Use of specific equipment How often are the following technical devices used? Overhead projectors	1 very rarely to 5 very often	2.38	1.628	Single item
	Use of specific equipment How often are the following technical devices used? IT/Computer	1 very rarely to 5 very often	4.15	1.016	Single item
	Use of specific equipment How often are the following technical devices used? Whiteboard	1 very rarely to 5 very often	2.94	1.563	Single item
	*Use of specific equipment How often are the following technical devices used? Projector (beamer)	1 very rarely to 5 very often	4.42	0.963	Single item
Vocational school (learning conditions)	*School name Name of the vocational school	free-text answer	10.75	5.505	Single item
Activity dimension (process category)					
Overload (overload)	*Overload: Because of the daily demands in my company I feel totally exhausted, tired and drained (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	2.79	1.025	Single item
Variety of tasks (work tasks)	*Variety of tasks: In my company I work on new tasks every now and then (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	3.56	1.028	Single item
Autonomy (work tasks)	*Autonomy: In my company I am able to decide what means to take to reach a goal (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	3.41	1.053	Single item
Relevance of tasks (work tasks)	*Relevance of tasks: In my company I am confronted with responsible tasks (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	3.92	0.978	Single item
Non-training tasks (work tasks)	*Non-training activities: In my company I have to deal with several tasks that are not part of my vocational training program (e.g. make coffee, copying, etc.) (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	2.16	1.170	Single item

Table 1 (continued)

Measured construct	Test/survey instrument and items	Range	M	SD	Cronbach's α (if applicable)
Complexity of tasks (work tasks)	*Complexity of tasks: In my company work tasks are characterized by considering a wide range of information (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	3.60	0.864	Single item
Training requirements and trainees' ability level (requirements)	*Training requirements and ability level: In my company, I am confronted with tasks that fit my abilty level (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	3.63	0.985	Single item
	*Training requirements and ability level: In my company I am confronted with tasks that are too complicated[r] (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	4.08	0.811	Single item
Involvement in occupational expert culture (social interaction)	*Involvement in occupational expert culture: My ideas and proposals are considered in my company (VET-LQI by Böhn & Deutscher 2021)	1 strongly disagree to 5 completely agree	3.48	1.006	Single item
Functional involvement (social interaction)	*Functional involvement: I am well integrated into the operational working procedures (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	4.00	0.886	Single item
Social involvement (social interaction)	*Social interaction: Employees in my company are interested in me (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	4.03	0.942	Single item
Mentoring (educational mediation)	*Mentoring: In my company nobody feels responsible for me[r] (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	4.13	1.073	Single item

Table 1 (continued)

Measured construct	Test/survey instrument and items	Range	M	SD	Cronbach's α (if applicable)
Curriculum orientation (educational mediation)	*Curriculum orientation: My in-company training program is implemented without a formal training plan[r] (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	3.93	1.361	Single item
Feedback (educational mediation)	*Feedback: The training personnel and my colleagues let me know whether I perform work tasks satisfactorily or not (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	3.95	1.035	Single item
Personnel and instructions (educational mediation)	*Competence of training staff: Those who train me on the job are technically competent (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	4.28	0.956	Single item
Cooperation between training company and vocational school (learning venue cooperation)	*Learning venue cooperation: My company always gives me time off to attend vocational school	1 strongly disagree to 5 completely agree	4.86	0.570	Single item
	*Learning venue cooperation: School education is not important to my company[r]	1 strongly disagree to 5 completely agree	4.36	0.921	Single item
	*Learning venue cooperation: In lessons at the vocational school, I often have the impression that my teachers don't know what is important in my training[r]	1 strongly disagree to 5 completely agree	3.68	1.087	Single item
	*Learning venue cooperation (Cooperation between school and company): • When managing work tasks in the company, I benefit from knowledge I accumulated during vocational school sessions • The in-company vocational training and the vocational school are well coordinated (VET-LQI by Böhn and Deutscher 2021)	1 strongly disagree to 5 completely agree	2.83	0.957	$\alpha = 0.66$

Table 1 (continued)

Measured construct	Test/survey instrument and items	Range	M	SD	Cronbach's α (if applicable)
Context dimension (context category)					
*Year in training (framework conditions)	*Year in training: Indication of year in training in which trainees are enrolled	1 = first year in training, 2 = second year in training, 3 = third year in training	1.46	0.566	Single item
*Training occupation (framework conditions)	*Training occupation: Indication of training occupation which trainees are trained for	0 = industrial trainees, 1 = office management trainees	0.43	0.495	Single item
Distance to training company (framework conditions)	Distance to work: How long does it take to get to work?	1 = less than 30 min, 2 = 30–60 min, 3 = 60–90 min, 4 = 90–120 min, 5 = more than 120 min	1.38	0.637	Single item
Premature termination of contract (output category)					
Direction of dropout intention	Upwards: I want to quit training to study at university (including dual university or university of applied sciences) Company change: I want to change my training company Occupational change: I want to change my training occupation Downwards: I want to work without any training (Krötz and Deutscher 2022)	1 strongly disagree to 5 completely agree	1.29 1.54 1.43 1.33	0.735 1.025 0.866 0.869	Single item Single item Single item Single item
General dropout intention	I often think about dropping out of my apprenticeship	1 strongly disagree to 5 completely agree	1.64	1.016	Single item

N maximum = 559. * Correlates significantly with one of the four dropout directions. [r] reversed items

Table 2 Sample distribution across occupations and year in training

Occupation	Year in training	Respondents	
		Absolute	Percentage
Industrial trainees		319	57.1
	1	193	34.5
	2	106	19
	3	20	3.6
Office management trainees		240	42.9
	1	128	22.9
	2	112	20
Total		559	100

within the regression model. The order in which the six blocks were included in the global model of the blockwise regression analysis was determined by the proximity of the dropout reasons to the trainees. Closest to the trainees and, therefore, potentially most relevant for analyzing dropout intention are *learner* factors (first block), followed by *professional* factors (second block), *company* factors (third block), *school* factors (fourth block), *activity* factors (fifth block), and *context* factors (sixth block). The first block of the *learner* dimension included socio-demographic variables as well as personal characteristics of the trainees such as age, gender, language, educational level, self-assessment of performance within the apprenticeship, father's highest degree (dummy), professional commitment, competence score in the supplier selection task and interests in German, accounting, and project organization. Block two, the *professional* dimension, contained items that ask the trainees whether the training occupation is the desired occupation and whether the trainees can identify with the occupation and the company. The third block, the *company* dimension, contained items regarding the company size, the availability of trainees outside their working hours, spare time, work climate, and learning opportunities. The fourth block, corresponding to the *school* dimension, included all variables relating to the conditions at the vocational schools, such as the relationship with teachers and classmates, the learning content, trainees' satisfaction with digitization, the school's equipment, and the use of certain equipment in lessons. The fifth block, the *activities* dimension, included variables relating to the work tasks (autonomy, variety, relevance, complexity of tasks, and non-training activities), the fit between training requirements and trainees' ability level, overload, interaction (social interaction, functional involvement, and involvement in occupational expert culture), and educational mediation (mentoring, curriculum orientation, feedback, personnel, and instructions), and the learning venue cooperation.[2] Finally, the last block, the *context* dimension, comprised all variables relating to the framework conditions of the training, such as the year in training and the training occupation (as a dummy variable).

[2] Learning venue cooperation originally belongs to the *context* dimension (Böhn & Deutscher 2022) when describing general framework conditions of training. Since our items relating to learning venue cooperation primarily cover the school, the training company, and their cooperation, learning venue cooperation was assigned to the activities dimension in our model.

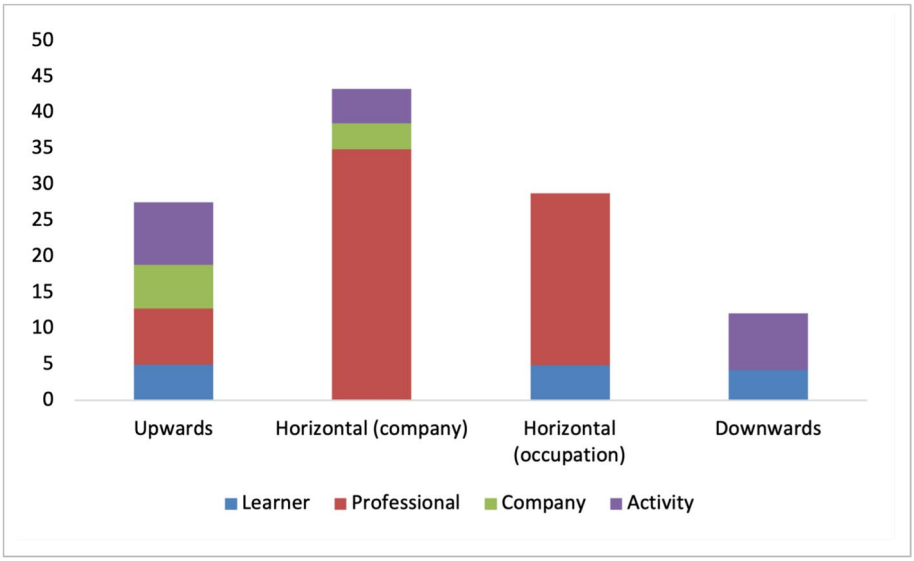

Fig. 2 Dimensions of dropout reasons and their association with the four directions of dropout intention (visualized as R^2 of the global model)

We calculated stepwise regression analyses to answer the second research question (RQ2) concerning the most important factors of dropout reasons for each direction of dropout intention, incorporating all 51 significant variables identified in the correlation analysis. The four smaller models were calculated to examine more thoroughly the most crucial factors of dropout reasons for each direction of dropout intention, with the aim of explaining as much variance as possible.

Results

Dimensions of dropout reasons associated with the four directions of dropout intention (RQ1)

The global model with six blocks of variables was calculated using linear regression for each of the four directions of dropout intention. By the blockwise inclusion of the respective variables of each dimension, changes in R^2 could be visualized.[3] Figure 2 illustrates the extent to which the dimensions of dropout reasons significantly explain the variance in the dependent variables (the four directions of dropout intention). It is evident that specific dimensions of dropout reasons and their respective factors are significantly associated with the four directions of dropout intention and that there are variations in the relevance of each dimension for the different directions of dropout intention. Similar to Krötz and Deutscher (2022), only a small proportion of the downward direction of dropout intention was related to the independent variables from the individual dimensions of dropout reasons (only 12.1%). However, the upward direction (27.5%) and the two horizontal directions (company: 43.3%, occupation: 28.8%) were related extensively

[3] Given the large number of factors (51 in total) across the dimensions of dropout reasons in the global model, we initially focus on changes in adjusted R^2 to obtain an overview of the relationship between these dimensions and the directions of dropout intention. In the main analysis of the smaller models, we then examine the individual predictor values for each direction of dropout intention.

to the six dimensions of dropout reasons. Factors of the *professional* dimension seem to play a decisive role in both horizontal dropout directions. While factors of the *company* dimension are only linked with two directions of dropout intention (upwards and company change), factors of the *learner, activity,* and *professional* dimension are linked with three of the four directions of dropout intention.

The *school* and *context* dimensions do not appear to be linked with the four directions of dropout intention. In addition, all four other dimensions appear to be relevant in the upward direction of dropout intention, followed by the three dimensions of *professional*, *company*, and *activity,* which seem to be linked to the horizontal direction (company change). However, only the two dimensions *professional* and *learner* seem to play a role in the horizontal direction (occupational change) of dropout intention, while only the dimensions of *learner* and *activity* seem to play a role in the downward direction of dropout intention.

Distinct factors of the dimensions of dropout reasons for each direction of dropout intention (RQ 2)

Factors of dropout reasons for an upward dropout intention

The model with the highest variance explanation regarding an upward direction of dropout intention (Table 3) contains a total of twelve factors from five dimensions of dropout reasons. These twelve factors were able to statistically significantly predict the upward dropout intention ($F[12, 230] = 8.451$, $p < 0.001$).

Two factors of the *learner* dimension (educational level and professional commitment: happy to take on responsibility) have a positive relation with the upward dropout intention. This means that a trainee's high *educational level* increases the intention to drop out upwards. Especially trainees with a high *school leaving certificate* (entry requirement to be able to study at universities) seem to show a high dropout intention in favor of higher education. The same applies to trainees with a higher level of *professional commitment*

Table 3 Small model 1: regression model on upward dropout intention

Predictors	B	SE	Beta	Sig
(constant)	2.680	0.519		0.000
Desired occupation	−0.134	0.042	−0.196	0.002
Relevance of tasks	−0.139	0.056	−0.156	0.014
Learning opportunities: didactic diversity	0.188	0.046	0.265	0.000
Availability outside working hours	0.178	0.061	0.172	0.004
Professional commitment: I am happy to take on responsibility	0.221	0.057	0.227	0.000
Learning venue cooperation: In lessons at the vocational school, I often have the impression that my teachers don't know what is important in my training[r]	−0.104	0.044	−0.136	0.021
Educational level	0.155	0.056	0.163	0.006
Complexity of tasks	−0.159	0.060	−0.163	0.008
Learning venue cooperation: my company always gives me time off to attend vocational school	−0.195	0.076	−0.150	0.010
Occupational identity	−0.119	0.049	−0.159	0.016
Use of a projector	−0.102	0.047	−0.123	0.031
Company size	0.044	0.022	0.123	0.047

B regression coefficient, *SE* standard error. $R^2 = 0.306$, adjusted $R^2 = 0.27$, [r] reversed items

(the more trainees like to take on responsibility, the higher their intention to drop out upwards). This could indicate that trainees who are willing to take on responsibility and demonstrate a solid foundation in their beliefs and personality to study at a university are, therefore, more likely to drop out upwards. The two factors of the *professional* dimension are negatively related to the intention to drop out upwards: the more the current training occupation is the *desired occupation* and the more the trainees can *identify* with it, the lower the intention to drop out upwards. The three factors of the *company* dimension show a positive relation to the intention to drop out upwards: a higher *company size, more learning opportunities (didactic diversity),* and increased *availability of trainees outside of their working hours* increase the intention to drop out upwards. A possible interpretation regarding the increased probability of dropping out upwards of trainees who experience *didactically diverse teaching methods* when learning in the company could be that they generally enjoy learning and appreciate it when knowledge and skills are taught using different teaching and learning methods. They appreciate the variety of instruction and thus demonstrate a solid basis for studying at a university. Similarly, the positive relationship between the larger *company size* and the increased probability of trainees dropping out upwards could be explained by trainees at larger companies presumably having greater ambitions and higher expectations of themselves than trainees employed by smaller companies. Dropping out upwards is also considered by trainees who often have to be *available outside their working hours*. It seems important that the workload during the apprenticeship is regulated so that trainees experience a good work-life balance. The four factors of the *activity* dimension (*learning venue cooperation: time off to attend vocational school*, *learning venue cooperation: impression that teachers know what is important*,[4] *relevance* and *complexity of tasks* at the workplace) also have a negative relation to the intention to drop out upwards. More *relevant* and more *complex tasks* can, therefore, reduce the intention to drop out upwards. The relevance and complexity of tasks at the workplace should correspond to the trainees' abilities and not under-challenge them. The same applies to the two factors of *learning venue cooperation* (*time off to attend vocational school* and the *impression that teachers know what is important in my training*). To reduce the intention to drop out upwards, it seems important that, on the one hand, the training occupation provides trainees with sufficient free *time to attend vocational school* and, on the other hand, the *teachers at the school know what is important* in the trainees' occupation and their training. A high degree of cooperation between the two training partners, therefore, appears to reduce the upward dropout intention. The *use of a projector* as a factor of digitization of teaching equipment within the *school* dimension has a negative relation to the intention to drop out upwards and can reduce the dropout intention. This means that VET schools using outdated digital infrastructure run a higher risk of losing apprentices upwards.

In comparison with the result of the upward direction of dropout intention from the paper by Krötz and Deutscher (2022), it is noticeable that the inclusion of further possible factors of dropout reasons (particularly variables from the *school* dimension [*use of a projector*] and the *learner* dimension [*professional commitment*]) increases

[4] *Learning venue cooperation: Teachers don't know what is important* is a reversed item, therefore the interpretation always refers to the positively formulated statement of the item.

the variance explanation and thus the explanatory power from R^2 of 0.088 (Krötz and Deutscher 2022) to R^2 of 0.27 in this study, which is a high variance explanation according to Cohen (1988). Regarding comparability with the study of Krötz and Deutscher (2022), it is important to note that their study was based on a longitudinal dataset of industrial trainees from Germany. While both studies were based on mostly the same variables, including factors from the *learner*, *professional*, *company*, *school*, and *activity* dimensions, Krötz and Deutscher (2022) did not include factors from the *context* dimension and focused primarily on training quality variables (factors mostly from the *activity* dimension). In contrast, our study incorporated factors from all six dimensions of dropout reasons. Both studies were based on items from the questionnaire developed by Böhn and Deutscher (2022). However, we used short scales and single-item measures, whereas Krötz and Deutscher (2022) used the original long scales and multi-item measures.

Factors of dropout reasons for a horizontal dropout intention (company change)

The horizontal intention to drop out concerning a change of company can be predicted by the model shown in Table 4, including a total of eight statistically significant factors of the dimensions of *learner*, *activity, professional*, and *context* ($F[8, 234] = 31.869$, $p < 0.001$).

Regarding the results of the association between *gender* (*learner* dimension) and company change, the stepwise regression analysis indicates that male trainees have a lower risk of expressing dropout intention in favor of changing companies than female trainees. The intention of changing companies can be mitigated by a high level of trainees' *organizational identity* (*professional* dimension). In contrast, there is a positive relation between *occupational identity* (*professional* dimension) and the intention to change the company. One possible interpretation of this relation is that trainees who strongly *identify with* their training *occupation* place significant emphasis on factors affected by the training company (e.g., performing non-training activities, overload, functional involvement of trainees). If these factors are not adequately implemented to meet the trainees' satisfaction within the training company, it might motivate them to switch to a different training company. This change could then present an opportunity to enhance the training conditions within the company and ensure that trainees continue to work in

Table 4 Small model 2: regression model on horizontal dropout intention (company change)

Predictors	B	SE	Beta	Sig
(constant)	3.012	0.457		0.000
Organizational identity	−0.375	0.058	−0.443	0.000
Non-training activities	0.174	0.045	0.201	0.000
Learning venue cooperation: School education is not important to my company[r]	−0.213	0.054	−0.197	0.000
Gender: male	−0.235	0.105	−0.109	0.025
Year in training	0.242	0.080	0.145	0.003
Functional involvement	−0.148	0.060	−0.128	0.015
Occupational identity	0.134	0.058	0.145	0.021
Overload	0.114	0.053	0.113	0.032

B regression coefficient, *SE* standard error. $R^2 = 0.521$, adjusted $R^2 = 0.505$, [r] reversed items

the chosen training occupation. Two of the four factors of the *activity* dimension show a negative relation to the horizontal dropout intention regarding a company change (*functional involvement* and *learning venue cooperation: school education is important to my company*[5]), while the other two factors show a positive relation (*non-training activities,* and *overload*). The more *non-training activities* the trainees have to carry out and the higher the *workload* at the workplace, the more likely the trainees are to express high intentions to change training companies. A high level of trainees' *functional involvement* in the company's processes, as well as trainees' impression that the company shows a high *importance of school education*, can help to reduce the intention to change the company. The relation of the factors of the *activities* dimension and the horizontal dropout intention (company change) supports our interpretation of *occupational identity* given above. It emphasizes the importance of trainees' positive perception of the training conditions within the company for their retention in the company. The stepwise regression analysis showed that dropout intention regarding changing companies increases with each additional *year in training* (*context* dimension). The results regarding a higher dropout intention the further advanced the trainees are in their apprenticeship may seem contradictory at first, but we need to remember that a dropout intention does not equal an actual decision and action to drop out. While discontent with one's VET training may rise over time, the costs of actually dropping out also rise, so higher dissatisfaction may reflect in a higher dropout intention but not in higher actual dropout rates at a later stage of VET.

With an adjusted R^2 of 0.505, the model of horizontal dropout intention regarding a company change shows a high variance explanation (Cohen 1988) and the highest variance explanation of all four directions of dropout intention. Comparing this result of the horizontal direction of dropout intention (company change) to the result of Krötz and Deutscher (2022), it is noticeable that the intention to change the company also showed the highest variance with an adjusted R^2 of 0.252. In our case, the inclusion of further possible factors of dropout reasons (particularly variables from the *professional* dimension [*organizational identity* and *occupational identity*] and the *activity* dimension [*learning venue cooperation*]) increases the variance explanation by 0.253.

Factors of dropout reasons for a horizontal dropout intention (occupational change)

Table 5 shows the model with the highest variance explanation for the horizontal intention to drop out regarding an occupational change ($F[5, 237] = 24.342$, $p < 0.001$). It includes five statistically significant factors from the *learner*, *professional*, *company*, and *context* dimensions.

A higher *age* (*learner* dimension) positively relates to the horizontal intention to drop out (occupational change). The higher the two factors *desired occupation* and *professional identity* of the *professional* dimension, the less likely trainees are to express dropout intentions in favor of changing occupations. The factor of *barely spare time* from the *company* dimension has a positive relation with the horizontal direction of dropout intention (occupational change). It seems that trainees appreciate a good work-life

[5] *Learning venue cooperation: school education is not important to my company* is a reversed item, therefore the interpretation always refers to the positively formulated statement of the item.

Table 5 Small model 3: regression model on horizontal dropout intention (occupational change)

Predictors	B	SE	Beta	Sig
(constant)	3.337	0.480		0.000
Occupational identity	−0.311	0.050	−0.366	0.000
Barely spare time	0.148	0.042	0.196	0.001
Desired occupation	−0.142	0.044	−0.183	0.001
Year in training	0.216	0.082	0.141	0.009
Age	0.041	0.018	−0.124	0.022

B regression coefficient, *SE* standard error. $R^2 = 0.339$, adjusted $R^2 = 0.325$

Table 6 Small model 4: regression model on downward dropout intention

Predictors	B	SE	Beta	Sig
(constant)	3.092	0.366		0.000
Social involvement	−0.192	0.052	−0.223	0.000
Year in training	−0.236	0.075	−0.185	0.002
Learning venue cooperation: School education is not important to my company[r]	−0.142	0.051	−0.170	0.006
Self-assessment	−0.112	0.046	0.146	0.016
Learning venue cooperation: in lessons at the vocational school, I often have the impression that my teachers don't know what is important in my training[r]	−0.100	0.043	−0.139	0.022

B regression coefficient, *SE* standard error. $R^2 = 0.202$, adjusted $R^2 = 0.185$, [r] reversed items

balance. Finally, the *year in training* (*context* dimension) also positively relates to the horizontal intention to drop out (occupational change), i.e., more years in training lead to a higher intention to drop out and change occupation.

This model also has a high variance explanation with an adjusted R^2 of 0.325 (Cohen 1988). Compared with the results of the horizontal direction of dropout intention (occupational change) of Krötz and Deutscher (2022), it is noticeable that the authors only had a moderate variance explanation with an adjusted R^2 of 0.199. In our study, the variance explanation increases to a high goodness-of-fit due to the inclusion of further possible factors of dropout reasons (in particular, the variables from the *context* dimension [*year in training*], *professional* dimension [*occupational identity*], and the *company* dimension [*barely spare time*]).

Factors of dropout reasons for a downward dropout intention

The model with the highest variance explanation regarding the downward intention to drop out (Table 6) comprises five statistically significant factors from three dimensions (*learner*, *activity*, and *context*) ($F[5, 236] = 11.912$, $p < 0.001$).

The factor *self-assessment* of the *learner* dimension has a negative relationship with the downward intention to drop out. This means that trainees who rate their overall performance during their training as rather poor are more likely to drop out downwards. The three factors of the *activity* dimension (*social involvement, learning venue cooperation: school education is not important to my company*, and *learning venue cooperation: impression that teachers don't know what is important in training*) show a negative relation to the intention to drop out downwards. This means that a high level of *social involvement* of trainees at the workplace contributes to a reduced intention to drop

out. The two factors of the *learning venue cooperation* (*importance of school education to the company*, *impression that teachers don't know what is important in the training*) are negatively associated with the intention to drop out downwards. Therefore, trainees' perception of good cooperation between the two training partners seems to counteract the intention to drop out downwards. A higher *year in training* (*context* dimension) also decreases dropout intention downwards. The more progressed trainees are regarding the year in training, the lower their intention to drop out.

With an adjusted R^2 of 0.185, this model has the lowest variance explanation of all four models. However, according to Cohen (1988), it still has a moderate variance explanation. Again, in comparison with the results of the downward direction of dropout intention by Krötz and Deutscher (2022), it becomes apparent that the variance explanation in our study is higher (particularly because of the inclusion of further variables from the *context* dimension [*year in training*] and the *activity* dimension [*learning venue cooperation*]). With an adjusted R^2 of 0.086, the authors have a low explanatory power. In both studies, the downward direction of dropout intention has the lowest explanatory power of all four directions of dropout intention.

Discussion

The study aimed to replicate and extend the study of Krötz and Deutscher (2022) with further factors of other dimensions of dropout reasons from the framework model by Böhn and Deutscher (2022), which may be related to the four directions of dropout intention. It confirms the results of previous dropout studies, which consider the dropout directions (see Table 7 for the confirmed factors and their relation), but differentiates many of the previous results more precisely for the four directions of dropout intention and their different predictors (see Table 7 for the more precise results). It moreover suggests new associations between factors of dropout reasons and the four directions of dropout intention (see Table 7 for new results).

The results of the first research question regarding the association of the six dimensions of dropout reasons and the four directions of dropout intentions reveal that only the *learner*, *professional*, *company*, and *activity* dimensions are significantly associated with the directions of dropout intention.

To analyze the associations of the individual factors of the six dimensions of dropout reasons with the directions of dropout intention in more detail and thus to answer the second research question, our results from the smaller and variance-maximizing models revealed the following (results are illustrated in Fig. 3): 23 of the 51 different factors of dropout reasons were significantly associated with the directions of dropout intention. In contrast to the results of the global model of the first research question, these factors stem from all six dimensions of dropout reasons. The two factors of *occupational identity* (associated with upward direction and occupational and company change) and *year in training* (associated with downward direction and occupational and company change) were significantly associated with three directions of dropout intention, and the three factors of *desired occupation* (upward direction and occupational change), *learning venue cooperation: school education is important to my company* (downward direction and company change), and *learning venue cooperation:*

Table 7 Confirmed more precise and new factors of dropout reasons and their relation to the directions of dropout intention by our study results

Confirmed results	Studies
Positive relation between *educational level* and upward dropout intention	Ma et al. (2024); Krötz and Deutscher (2022); Bessey and Backes-Gellner (2015)
Negative relation between *occupational identity* and occupational change	Kirchknopf and Kögler (2022)
Negative relation between *organizational identity* and company change	Kirchknopf and Kögler (2022)
Negative relation between *desired occupation* and upward dropout intention	Ma et al. (2024); Holtmann and Solga (2023)
Negative relation between *desired occupation* and occupational change	Ma et al. (2024); Findeisen et al. (2024a); Holtmann and Solga (2023); Krötz and Deutscher (2022)
Negative relation between *social involvement* and downward dropout intention	Krötz and Deutscher (2022)
Positive relation between *non-training tasks* and company change	Krötz and Deutscher (2022)
More precise results	
Negative relation between orga*nizational identity* and company change	Maué et al. (2023)
Positive relation between *barely spare time* and occupational change	Schuster (2016); Greilinger (2013); Ernst and Spevacek (2012)
Negative relation between the *use of a projector* (as a factor of digitization of VET schools) and upward dropout intention	Schuster (2016)
Negative relation between *social involvement* and downward dropout intention	Maué et al. (2023)
Negative relation of *year in training* and downward dropout intention	Bessey and Backes-Gellner (2015); Laporte and Müller (2011)
Novel results	
Positive relation between importance of trainees' *professional commitment* and upward dropout intention	
Negative relation between *occupational identity* and upward dropout intention	
Positive relation between *occupational identity* and company change	
Negative relation between *learning venue cooperation: importance of school education to company* and downward dropout intention and company change	
Negative relation between l*earning venue cooperation: impression that teachers know what is important in training* and upward and downward dropout intention	
Negative relation between *learning venue cooperation: time off to attend vocational* school and upward dropout intention	
Negative relation between *functional involvement* and company change	
Positive relation of *year in training* and both horizontal directions	

impression that teachers know what is important in training (upward and downward direction) were associated with two directions of dropout intention.

Besides these factors, which are associated with several directions, the results show that further two to nine factors are typical for one direction of dropout intention. For example, trainees who show a high *professional commitment* regarding the *willingness to take on responsibility* or prefer the *didactic diversity of learning opportunities* showed a higher intention to drop out upwards in favor of studying at a university. In contrast, trainees who perceive low *social involvement* at the workplace showed a higher intention to drop out downwards and leave the VET system without qualification. While a low *organizational identity* and performing many *non-training activities*

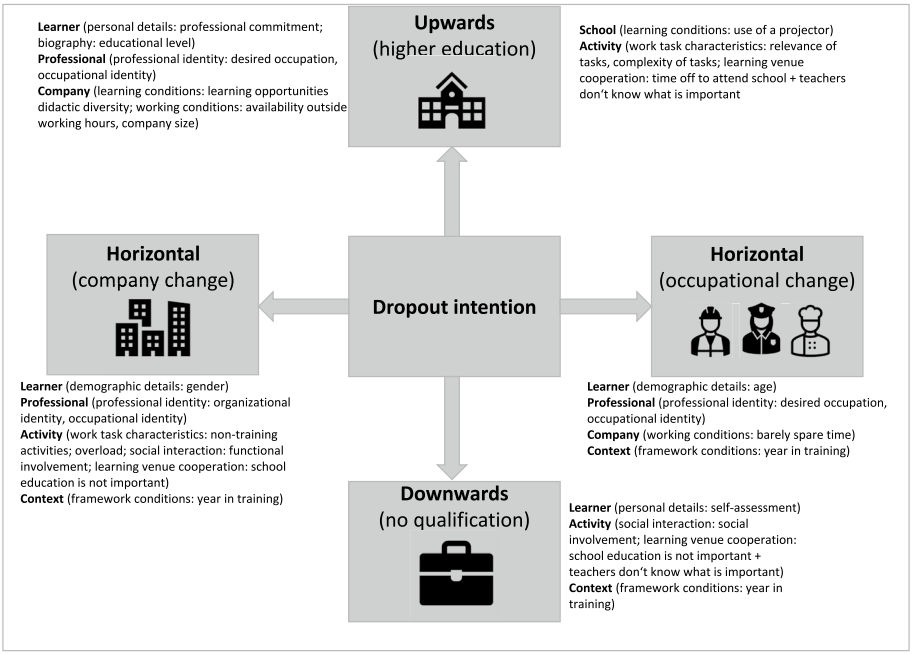

Fig. 3 Factors of dimensions of dropout reasons and their association with different directions of dropout intention (adapted from Krötz and Deutscher 2022)

are related to the intention to change companies, a lack of *spare time* caused by the training is related to the intention to change occupations.

Indeed, the results underline that dropout and, more precisely, dropout intention is affected by an interaction of various factors of the dimensions of input (factors from the *company*, *professional*, *school*, and *learner* dimensions), process (factors from the *activity* dimension at training companies and schools), and *context.* Dropout is therefore a complex process (see Rohrbach-Schmidt and Uhly 2015; Ertelt 2003; Lamamra and Masdonati 2008) with mostly varying reasons for different dropout directions (see Fig. 3). Therefore, we believe it is crucial to differentiate between dropout directions in future dropout research and in national and international statistics and reporting. Here, we see an urgent need to extend national and international data collection to include subsequent paths after the dropout decision or—if this information is too costly to assess—to assess quality aspects of VET and directional intentions.

In line with Findeisen et al.'s (2024b) results, we interpret dropout intention as an imperfect but somewhat predictive proxy for actual dropout. However, more research is needed to understand the relation between dropout intention and actual dropout in different domains. Results so far suggest that the predictive validity of dropout intention for dropout behavior varies with educational domains (Findeisen et al. 2024b) and with different directions of dropout intention (Findeisen et al. 2024a). It is also plausible that results differ for different vocational domains. For commercial trainees, information about this relationship is currently only available for German cooks, among whom there is a positive, albeit weak, relationship between dropout intention and actual future dropouts (see Findeisen et al. 2024b).

To prevent the costs and loss of time caused by actual dropouts, dropout intention can be considered an indicative tool to identify potential dropouts early and initiate appropriate prevention interventions. Awareness of the different associations of the factors of dropout reasons with each direction of dropout intention and using this information at an early stage of VET is crucial for practitioners to intervene more effectively. For instance, VET schools could think about offering up-to-date digital infrastructure and learning environments to mitigate trainees' dropout intentions. Enhancing cooperation is another interesting possibility for training partners to reduce dropout intentions. VET schools could focus on teachers possessing practical knowledge regarding what is important in training. In contrast, companies could focus on ensuring that their training staff recognize the importance of learning at the vocational school alongside learning at the company. Furthermore, companies could explore the two factors of the fit of the desired occupation and the occupational identification of trainees with the training occupation in more detail. They could think about promoting trainees' occupational identity by involving them socially as more equal employees and via social events and letting them solve meaningful tasks more independently. As the year in training was also associated with three directions of dropout intention, companies could also evaluate trainees' dropout intentions during their apprenticeship to avoid possible dropouts in the future. Finally, companies could focus on improving the further factors associated with the specific direction of dropout intention that the company is currently aiming to prevent (e.g., regarding the association of barely spare time and the intention to change occupations: companies could explore implementing flexible working hours for trainees). However, it is presumably most effective if companies diagnose the dropout intentions of each apprentice and their perception of the relevant drivers so they can tailor measures on the individual level to prevent actual dropout decisions.

Limitations and outlook

The study has several limitations. First, the survey took place around February 2022 with trainees from all 3 years in training. This means that at the time of the survey, presumably, some trainees had already dropped out since the start of VET training in September. The cross-sectional structure of our data also precludes the possibility to draw causal inferences. Future studies should, therefore, explore the associations found between the factors from the dimensions of dropout reasons and the directions of dropout intention using a longitudinal design.

Furthermore, the industrial and office management trainees we surveyed showed very low values for dropout intention in all four directions and the general dropout intention (mean values between 1.29 and 1.64, see Table 1), aligning with the low dropout rate of industrial trainees in Germany (Bundesinstitut für Berufsbildung 2024). The low dropout rate in this occupation may limit the generalizability of our findings, as our data may not fully capture the dropout processes that are more pronounced in fields with higher dropout rates, such as system catering specialists (53.5%) or cooks (51.4%; Bundesinstitut für Berufsbildung 2024). However, the findings still offer valuable insights and identify potential intervention points for two of the most commonly chosen training occupations in the commercial sector, which together account for 37,920 new training contracts in 2022 (15,390 for industrial trainees and 22,530 for office management

trainees; German Federal Statistical Office 2023). Similar occupation-specific studies in other fields, such as car mechatronics or nursing, are needed, as the dropout phenomenon appears to be in part domain-overarching and in part domain-specific.

A further limitation is that other factors related to dropout intention could be missing in our study. Research showed that financial factors and income also play an important role in the decision to drop out (Kropp et al. 2014; Bessey and Backes-Gellner 2015; Neuber-Pohl 2021). Furthermore, factors like compromises between the desired and realized occupation regarding social status, gender type, and occupational interests were also found to increase the risk of dropping out (Ahrens et al. 2021; Beckmann et al. 2023). Factors assessing the financial situation, financial prospects of trainees, and career compromises were not included in our study. Such factors should be considered in future studies to investigate how they influence the different directions of dropout intentions.

The results obtained are only reliable for the construct of dropout intention. The findings of a systematic literature review (Findeisen et al. 2024b) and an empirical study (Findeisen et al. 2024a) indicate a significant positive relationship between dropout intention and future actual dropouts. Dropout intention can, therefore, be seen as positively related to dropout behavior. However, this relationship seems to be medium-sized and dependent on (a) different dropout directions, (b) the measurement instruments used for the assessment of dropout intention, and (c) the respective occupational contexts in which the studies are conducted. Therefore, dropout intention should always be interpreted with caution. More research is needed to determine if and how assessments of early dropout intentions and training quality throughout the educational process can be leveraged to prevent dropout behavior in longitudinal studies implemented within practical program designs.

Appendix

See Figs. 4, 5; Tables 8, 9, 10.

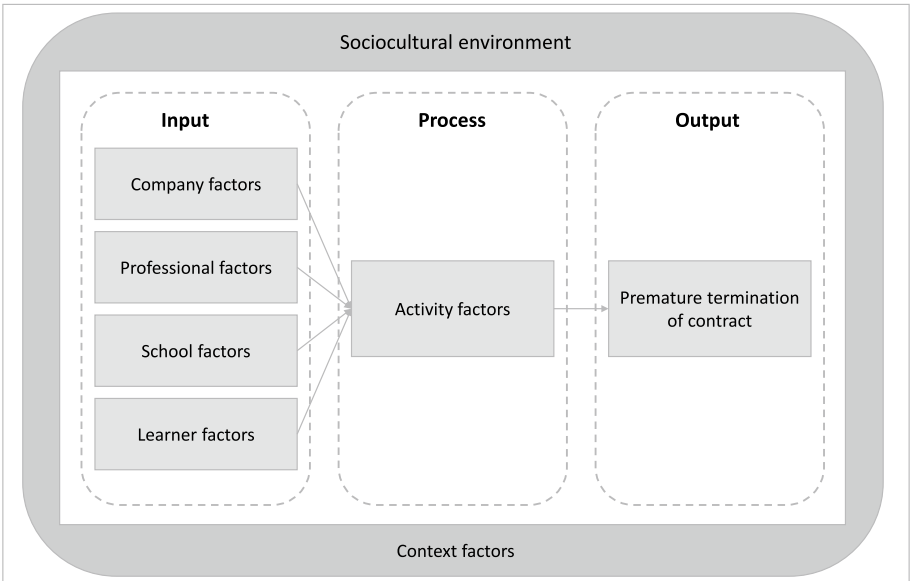

Fig. 4 Framework model of premature termination of contract

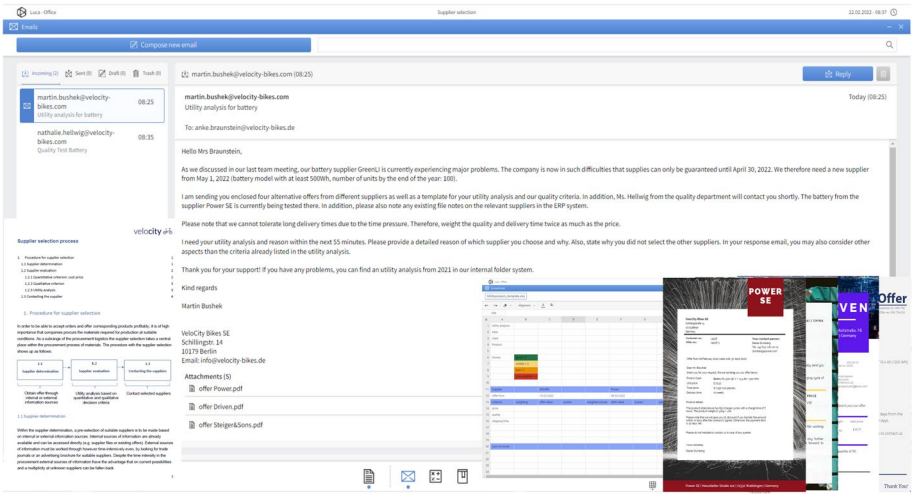

Fig. 5 Task of supplier selection within the virtual office simulation

Table 8 Background information of trainees

Aspect	Coding	Frequency	Percentage	Valid percentage	Cumulated percentage
Gender N = 548	Female	390	69.8	71.2	71.2
	Male	158	28.3	28.8	100.0
Educational level (highest school leaving certificate) N = 556	Lower secondary school certificate (Hauptschulabschluss)	10	1.8	1.8	1.8
	Secondary school certificate (Mittlere Reife)	196	35.1	35.2	37.0
	Advanced technical college (Fachhochschulreife)	180	32.2	32.4	69.4
	General higher education certificate (allgemeine Hochschulreife/Abitur)	170	30.4	30.6	100.0
Grade (average grade in school leaving certificate) N = 551	1.0–1.5	37	6.6	6.7	6.7
	1.6–2.0	93	16.6	16.9	23.6
	2.1–2.5	196	35.1	35.6	59.2
	2.6–3.0	149	26.7	27.0	86.2
	3.1–3.5	65	11.6	11.8	98
	3.6–4.0	9	1.6	1.6	99.6
	> 4.0	2	0.4	0.4	100.0
Training performance (self-assessed grade) N = 554	1.0–1.5	77	13.8	13.9	13.9
	1.6–2.0	216	38.6	39.0	52.9
	2.1–2.5	151	27.0	27.3	80.2
	2.6–3.0	85	15.2	15.3	95.5
	3.1–3.5	15	2.7	2.7	98.2
	3.6–4.0	6	1.1	1.1	99.3
	> 4.0	4	0.7	0.7	100.0
Aspired final grade N = 553	1.0–1.5	161	28.8	29.1	29.1
	1.6–2.0	250	44.7	45.2	74.3
	2.1–2.5	115	20.6	20.8	95.1
	2.6–3.0	25	4.5	4.5	99.6
	3.6–4.0	2	0.4	0.4	100.0
Language(s) (spoken at home) N = 556	Only German	350	62.6	62.9	62.9
	More than German	191	34.2	34.4	97.3
	Only other than German	15	2.7	2.7	100.0
Terminated training before N = 556	No	481	86.0	86.5	86.5
	Yes	75	13.4	13.5	100.0

N maximum = 559

Table 9 Descriptive statistics on further trainee scales

Scale	N	Min	Max	M	SD
Age	555	17	40	21.2	2.8
Desired Occupation*	552	1	5	3.4	1.2
Competence score	559	1.8	75.1	47	17

N maximum = 559. *measured on a 5-level Likert scale (1 = strongly disagree, 5 = completely agree)

Table 10 Frequency of different directions for dropout intentions

	Upwards		Company change		Occupation change		Downwards	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	450	82.0	399	72.5	408	74.9	464	84.1
2	60	10.9	58	10.5	71	13.0	35	6.3
3	22	4.0	58	10.5	41	7.5	24	4.3
4	11	2.0	16	2.9	18	3.3	17	3.1
5	6	1.1	19	3.5	7	1.3	12	2.2
Total	549	100.0	550	100.0	545	100.0	552	100.0

1 = strongly disagree, 2 = mostly disagree, 3 = partly agree, 4 = mostly agree, 5 = completely agree

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s40461-024-00173-1.

Supplementary Material 1.

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Author contributions
Anke Braunstein: wrote the original draft, collected the data, analyzed, interpreted, and visualized the data. Maximilian Krötz: developed the model of different directions of dropout intention, assisted during the calculations, prepared the data, read, and reviewed the manuscript. Viola Deutscher: reviewed and edited the manuscript, helped with the conceptualization, and supervised. Jürgen Seifried: reviewed and edited the manuscript, helped with the conceptualization, and supervised. All authors read and approved the final manuscript.

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Availability of data and materials
The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Competing interests
The authors declare that they have no competing interests.

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