Technische Universität München

TUM School of Management

The Development of Entrepreneurial Intentions

Seminar Paper

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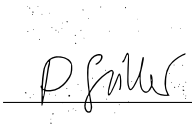
Signature: 

Philipp Stiller

Abstract

Due to the economic importance of entrepreneurship, the research interest in the field of Entrepreneurial Education has increased significantly. Building on the discussion of whether entrepreneurs are born or made, this study assesses the role of Entrepreneurial Education for Entrepreneurial Intention by evaluating the impact of a university Entrepreneurial Class on Entrepreneurial Intention. Two distinct research questions will be answered. First, we partially reconfirm the widely accepted theory that the antecedents of Ajzen's Theory of Planned Behavior predict Entrepreneurial Intention. Second, we assess whether the antecedents mediate the effect of Entrepreneurial Classes on Entrepreneurial Intention. This study uses an ex-post research design of a cross-sectional dataset. Our findings contribute to the Theory of Planned Behavior, however, we find a negative and insignificant effect of Entrepreneurial Educations on Entrepreneurial Intention. Thus, no mediation effect can be observed.

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Acronyms

SEE Entrepreneurial Event

TPB Theory of Planned Behavior

EI Entrepreneurial Intention

EE Entrepreneurial Education

EC Entrepreneurial Class

ATB Attitude toward Behavior

SN Subjective Norm

PBC Perceived Behavioral Control

SEBA Software Engineering for Business Applications

TUM Technical University of Munich

LMU Ludwig Maximilian University of Munich

YAA Young Achievement Australia

1 Introduction

1.1 Principal Topic

The research field of Entrepreneurial Intentions (EIs) started growing in the past years and gained some attention as a powerful framework to predict and explain behavior performed by entrepreneurs. Liñán and Fayolle (2015) stated that 409 papers dealt with this field just between 2004 and 2013. Besides researchers, academic institutions and governments developed an interest in this topic over the recent years as they have recognized its potential to contribute to the country's economic and social development. That is why a great variety of entrepreneurship programs exist nowadays (Fayolle and Gailly, 2015; Garavan and O' Cinneide, 1994; Martin et al., 2013).

The concept of intentions is stemming from the field of psychology, where models are built to solve the difficult task of explaining human behavior (Ajzen, 1991). Entrepreneurship is generally classified as a research discipline of Management (Shane and Venkataraman, 2000), which makes EI a joint field of both: psychology and management.

Two coexisting models laid the theoretical foundation for studies of input factors for EIs: Shapero introduced the model of the Entrepreneurial Event (SEE) that claimed desirability and feasibility as well as the propensity to act to be the three major impact factors on EI (Shapero, 1984; Shapero and Sokol, 1982). In 1985, Ajzen (1985) laid the foundation for the Theory of Planned Behavior (TPB), which he further developed in his seminal paper "The Theory of Planned Behavior" (Ajzen, 1991). In this paper, he presented a corresponding framework, which postulated that Attitude toward Behavior (ATB), Subjective Norm (SN) and Perceived Behavioral Control (PBC) were the major influence factors for intentions.

1.2 Research Gap

In recent years, the models of Ajzen and Shapero were applied in studies to different contexts to test their validity under varying circumstances such as diverse cultural backgrounds or family environments (Hayton et al., 2002; Laspita et al., 2012; Liñán and Chen, 2009; Mueller and Thomas, 2001). Krueger and Carsrud (1993) outlined the applicability of the TPB to the business context, where entrepreneurship training could be analyzed. However, a main research focus of the TPB was dedicated to the Entrepreneurial Intention of students (Fayolle and Gailly, 2015). Findings regarding this relationship are covered in detail in section 2.3.

In general, two major positions are presented in the literature. On the one hand, a positive effect of the participation in Entrepreneurial Education (EE) on the EI was found (Peterman and Kennedy, 2003; Zhao et al., 2005). On the other hand, significant negative effects were identified by studies as well (Lorz and Volery, 2011; Oosterbeek et al., 2010; Von Graevenitz et al., 2010).

Von Graevenitz et al. (2010) declared the effect of Entrepreneurial Classes (ECs) on the willingness to engage as an entrepreneur to be unknown and also Oosterbeek et al. (2010) mentioned that major variances in programs could lead to different outcomes on the students' intention. Fayolle and Liñán (2014) summarized the current research situation and outlined several knowledge gaps in the field of EI to redirect the focus of researchers. Besides other topics, the nature and effect of EE was mentioned to remain an important subject to study (Liñán and Fayolle, 2015).

1.3 Research Questions and Structure

Based on the suggestions from Fayolle and Liñán (2014), we analyze the impact of the participation in ECs at a university on EI. Thus, our two distinct research questions can be formulated as follows:

Research Question I: "How does Ajzen's Theory of Planned Behavior explain the formation of Entrepreneurial Intentions?"

Research Question II: "How does Ajzen's Theory of Planned Behavior explain the impact of Entrepreneurial Classes on the formation of Entrepreneurial Intentions?"

The remainder of this paper is structured as follows. First, we explain the underlying theoretical models of EI in section 2.1 and analyze the current research situation in the field of EE in section 2.3. In particular we develop an approach to characterize EE and summarize the findings of the impact of EE on EI. Based on this, we describe our research design in chapter 3 and finally present and discuss our findings with regard to the state-of-the-art research in chapter 4 and 5.

2 Theory and Hypotheses

2.1 Ajzen's Theory of Planned Behavior

"Intentions have proven the best predictor of planned behavior, particularly when that behavior is rare, hard to observe, or involves unpredictable time lags" (Krueger et al., 2000, p. 411). A famous model to capture the development of intentions was developed by Ajzen (1991) in the Theory of Planned Behavior (TPB), which is the theoretical basis of our study. In this subsection, we explain the model with its antecedents of intention.

Intentions reflect a person's motivation and willingness to engage in efforts to perform the behavior. Thus, the greater the intention, the more likely is the action. From this follows that Entrepreneurial Intention (EI) is a good predictor of actual behavior. While this relationship is quite natural and obvious, the TPB focuses on the question of what influences the intention and how it can be predicted. According to the theory, intentions have three antecedents (see: Figure 2.1): Attitude toward Behavior (ATB), Subjective Norm (SN) and Perceived Behavioral Control (PBC).

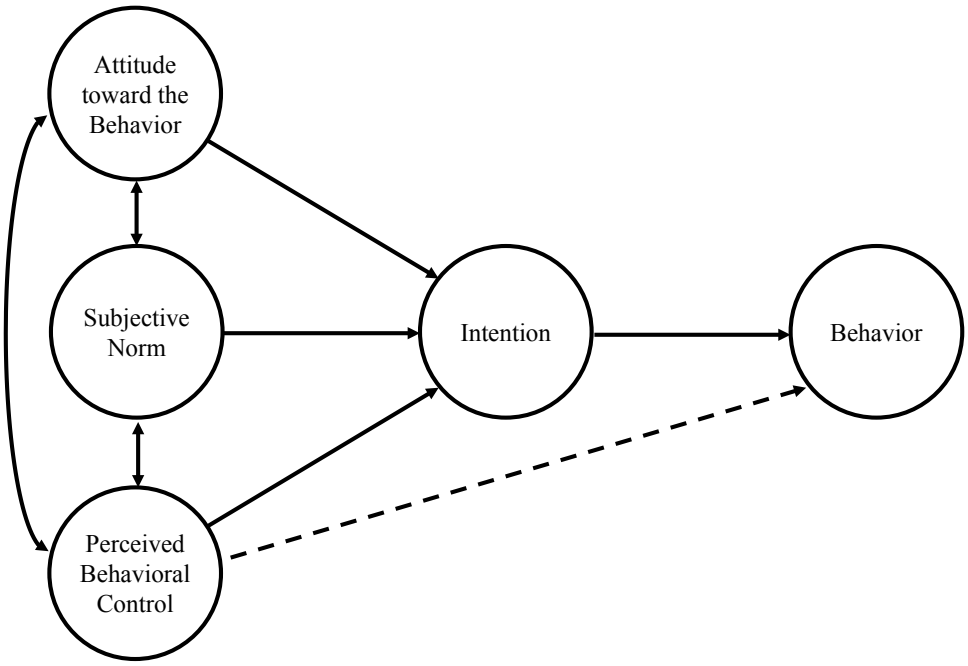


Figure 2.1: Theory of Planned Behavior - Source (Ajzen, 1991)

2.1.1 Attitude toward Behavior

The ATB reflects the personal opinion about the behavior and therefore is an internal influence factor (Ajzen, 1985). When a person is confronted with a new situation that requires action, they can draw from their memories of prior behavior. The former actions and their outcomes are already positively or negatively evaluated and used to build the new attitude. Ajzen (1988) found a high correlation between ATB and actual behavior. Additionally, he sees high value for predictions in this antecedent, as it can be measured before an action.

2.1.2 Subjective Norm

The SN reflects the social pressure imposed on an individual by others, i.e. family, friends or even cultural norms (Ajzen, 1991). Ajzen claims that people assess to what extent their personal influence sphere might approve or disapprove of an action. These are the so called normative beliefs. The SN then depends on the normative beliefs and the willingness to adhere to them. In contrast to PBC and ATB, SN is the only antecedent representing external influences.

2.1.3 Perceived Behavioral Control

The last antecedent is the PBC. A person might feel or not feel capable of pursuing an action and therefore is encouraged or discouraged (Ajzen, 1988). PBC depends on the control beliefs from previous actions and experience from others. Ajzen prefers the perception over the actual behavioral control. It is understandable that a behavior which is not under one's control due to the lack of resources, personal or other constraints, cannot be pursued. That is why he focused on the perception thereof. In contrast to SN, PBC is another internal influence factor. Ajzen (1988) stated that there is a strong correlation between PBC and actual behavior. Furthermore, he stressed that the PBC is affected by situation and thus differs from the person's general locus of control.

2.2 The Theory of Planned Behavior in Entrepreneurship and Hypothesis I

TPB was developed for intentions in various settings. Therefore, we put the model in following paragraphs in the context of entrepreneurship in general and EI in particular and outline how it is perceived in entrepreneurship literature.

Krueger et al. (2000) mapped the TPB components on terms that are more common in the entrepreneurship literature. PBC was rephrased as perceived self-efficacy, whereas ATB and SN where together rephrased as perceived desirability. However, they found that SN as a factor of perceived desirability has little impact on intent in the entrepreneurial setting. Fitzsimmons and Douglas (2011) even claimed this to be the "predominant view". Ajzen (1991) himself concluded that depending on the context, personal characteristics might be stronger predictors than the influence of other people.

Fitzsimmons and Douglas (2011) covered the interaction between perceived desirability and perceived self-efficacy in more detail in the entrepreneurial context. According to their paper, either of those influence factors is sufficient to form EIs. If perceived desirability is high, adding perceived self-efficacy does not significantly add to the score of intention. The same applies to

high perceived self-efficacy and low desirability. This is in contrast to the TPB. Fitzsimmons and Douglas (2011) referred to this phenomenon in their paper as "natural entrepreneur" (high perceived desirability/high perceived self-efficacy), "accidental entrepreneur" (low/high) and "inevitable entrepreneur" (high/low).

In general, the Theory of Planned Behavior is considered to be state-of-the-art (Krueger et al., 2000). Even though it was originally not tailored to entrepreneurship, it became one of the most frequently applied theories in the research area of EI (Fayolle and Gailly, 2015). Additionally, the TPB is well suited for studies about the influence of EE on EIs (Maresch et al., 2016). According to Krueger and Carsrud (1993, p. 327), "the theory of planned behaviour demonstrate great utility to social psychologists and thus offer considerable potential for entrepreneurship researchers. For instance, researchers might use this model to analyse how the process of doing a business plan or entrepreneurial training affects intentions."

As a consequence, our hypotheses 1a-1c aim at verifying the TPB by providing evidence for the following statements.

Hypothesis 1a: The Attitude toward Behavior positively and significantly effects the person's Entrepreneurial Intention.

Hypothesis 1b: The Subjective Norm positively and significantly effect the person's Entrepreneurial Intention.

Hypothesis 1c: The Perceived Behavioral Control positively and significantly effects the person's Entrepreneurial Intention.

2.3 Entrepreneurial Education

Based on the well-grounded understanding of how intentions develop from a behavioral psychology perspective and its application in the field of entrepreneurship, researchers have gone a step further. Fayolle and Gailly (2015) emphasized the need for further research investigating the impact of Entrepreneurial Education (EE) on EIs. Gorman et al. (1997) found in their extensive literature review that EE encourages entrepreneurship. Also Kuratko (2005) highlighted

that it is generally accepted that entrepreneurs are made and not born. However, he claimed that the body of research still lacks clear evidence for a positive impact of EE on EIs. The goal of this section is twofold: First, we develop a clear understanding of what EE is and outline three dimensions along which ECs can be described. Second, we present the findings from the literature of the impact of EE on EIs and derive our hypothesis.

2.3.1 Defining Entrepreneurial Education

Fayolle et al. (2006, p. 702) defined ECs "as any pedagogical programme or process of education for entrepreneurial attitudes and skills, which involves developing certain personal qualities". These include an innovative approach to problem solving, the ability to adapt to change, become self-reliant and to develop one's creativity (Henry et al., 2005). According to Kuratko (2005, p.585) and Ronstadt (1990) "students must be prepared to thrive in the 'unstructured and uncertain nature of entrepreneurial environments'". Over the recent years, many different forms of EE have been established (Kuratko, 2005). But Pittaway and Cope (2007) pointed out that no clear understanding of EE exists. Based on the works of Garavan and O' Cinneide (1994); Henry et al. (2005); Kuratko (2005); Pittaway and Cope (2007), we identify three dimensions along which the ECs can be described. These dimensions are the EC's goal and target audience, the content and the pedagogical method, which are outlined in the following.

It is widely accepted that different skills are required during the entrepreneurial process (Henry et al., 2005). Hence, ECs can be categorized with respect to the stage of the entrepreneurial process, which they address. Jamieson (1984) proposed three "stages" along that process: education about enterprise, education for enterprise and education in enterprise. In the first stage, EE focuses on students without a clear intention to start a company. These classes mostly take a theoretical perspective on how to found a company. The second stage of ECs addresses students who strive to be self-employed. These courses are commonly practice-oriented with the goal to have a company founded or at least a business plan finished by the end of the class. The final stage deals with topics relevant for successful entrepreneurs.

The content of EE can be highly diverse ranging from practical tools to devise a business plan to

macroeconomic considerations and ethical aspects of entrepreneurship (Kuratko, 2005). Garavan and O' Cinneide (1994) pointed out that the content of ECs often depends on the instructor's personal understanding of entrepreneurship. However, they highlight that common topics include idea generation, business planning and formation, market research and product development. Based on the work of Ronstadt (1990), Kuratko (2005) identified the following fields in EE: entrepreneurial vs. managerial domains, venture financing, corporate entrepreneurship, entrepreneurial strategies, psychological aspects predicting future success, risk of an entrepreneurial career, minority entrepreneurs, entrepreneurial spirit, economic and social contributions as well as ethics.

Garavan and O' Cinneide (1994) and Randolph and Posner (1979) provided a framework to categorize the pedagogical techniques applied in EE (see: appendix 4). According to the authors, these can be reflective-theoretical, reflective-applied, active-theoretical, and active-applied. The first pedagogical technique aims at changing the student's knowledge and includes, for instance, theory lectures and required readings. Reflective-applied methods can be psychological reflections, limited discussions and role plays. The third technique aims at changing the understanding of entrepreneurship through focused learning groups, experiments, workshops and coaching. Finally, within the active applied methods, skills and attitudes are changed and methods such as field projects are used.

2.3.2 The Impact of Entrepreneurial Education on Entrepreneurial Intentions

Building on the definition of Entrepreneurial Education (EE), we now move to the relation of EE and EI. Within this section, we direct the focus towards the state-of-the-art literature findings in the field of EE in order to outline the niche where our study contributes to.

The underlying question, which many studies tried to answer is whether the participation of an individual in an EC leverages their EI. In this context, two coexisting, opposing positions can currently be observed in literature. While some studies presented a positive effect through the exposure of EE on EIs (Peterman and Kennedy, 2003; Solesvik, 2013; Zhao et al., 2005),

others found evidence for a negative effect of participating in EE on the EI (Oosterbeek et al., 2010; Von Graevenitz et al., 2010). A selection of remarkable studies in these opposing research positions will be presented in the following. These papers have been selected based on their methodological rigor, which implies a longitudinal pre-test/post-test study design and a significant sample size (see: chapter 3).

Peterman and Kennedy (2003) found a positive relationship of participating in EE on EI. The authors applied Shapero's model and analyzed the change of perceived desirability and perceived feasibility of pupils. The study subjects were enrolled in the Young Achievement Australia (YAA) enterprise program over five months and were taught about life cycle of company including marketing, human resources, finance and product development (Peterman and Kennedy, 2003). A pre-test/post-test design including control groups was used. One hundred twelve individuals of the YAA program and 112 students from the same class, who did not enroll, responded to the questionnaire. The age range was between 15 and 18 years. Desirability and feasibility perceptions of YAA participants were significantly higher than the control group's perception. This resulted in Peterman and Kennedy (2003)'s conclusion that underlined the success of the YAA program due to its positive influence on the EI of pupils.

Also Zhao et al. (2005) measured a positive effect of EE on EI when analyzing the attitude of MBA students at the beginning and end of their degree at five American universities (Zhao et al., 2005). A total of 265 matched responses were collected, which showed a support for both: the significant effect of the MBA program on EI as well as the mediating effect of self-efficacy for EI. One limitation was that no control group was used to control for external factors.

Solesvik (2013) tested the TPB against a data sample of 321 students from three universities in Nikolaev in the Ukraine, where the students' major was differentiated between business and engineering. Since the engineering students did not participate in an entrepreneurship class, Solesvik (2013) could measure the effect of participation on EI as well as on the antecedents of EI. A significant positive correlation was found between the major in business as well as parental self-employment on EI. Additionally, the mediating effect of Ajzen's antecedents could be validated. This led to the conclusion that the engineering focused Ukrainian economy could highly benefit from entrepreneurial elements in engineering degrees due to the potential

raise of human capital (Solesvik, 2013).

Von Graevenitz et al. (2010), however, identified a negative impact of the effects of EE on EI. Their data has been collected by the department of Business Administration at Ludwig Maximilian University of Munich (LMU) with 196 matching respondents and no control group. The course "Business Planning" is a mandatory element of the curriculum and involves lectures and integrated exercises. The main learning goals were: planning and managing a startup such as creating a business plan, gathering of knowledge about enterprises, entrepreneurship and the gaining of soft skills (Von Graevenitz et al., 2010). The data was collected right after the kickoff of the project and before receiving the final grade. Initially, 71.4% of the 196 students indicated an EI. After the completion of the course, the amount reduced significantly to 63.8%. Von Graevenitz et al. (2010) suggests that the reason for this difference is that individuals realize that they do not possess the necessary skills to pursue a career as an entrepreneur.

Another major study conducted by Oosterbeek et al. (2010) challenged Ajzen's TPB. They examined the impact of EE on students with similar degrees, which are enrolled in a vocational college in the south of the Netherlands. The college had three campuses, of which only one would offer the so-called "Junior Achievement Young Enterprise student mini-company (SMC) program". This program was described by Oosterbeek et al. (2010, p. 444) as "the leading entrepreneurship education program in post-secondary education in the Netherlands". This program makes groups of students engage in a small short-time business from setup to liquidation. The goal is an increase in self-confidence, motivation as well as a change of attitude to be proactive, creative and team focused (Oosterbeek et al., 2010). The outcome of the analysis was an insignificant effect on the self-assessed entrepreneurial skills and even a negative effect on the EI. This better self-perception was used by Oosterbeek et al. (2010) to explain the decreased EI when lacking skills to be an entrepreneur.

Finally, Lorz et al. (2013) claimed that many publications showing positive effects of EE on EI have "methodological deficiencies" (Lorz and Volery, 2011, p. 1) due to missing pre-test measurements, missing control-groups or small sample sizes (Lorz and Volery, 2011). The author mentioned the study of Peterman and Kennedy (2003) to be the only valid one showing a significant positive effect of EE on EI. However, his systematic literature review from 2013

named 93 studies in total out of which 65 present a positive effect, three a negative effect, 20 an insignificant, three a contingent and two an unclear result (Lorz et al., 2013). The author himself analyzed three different treatment groups, which participated in additional qualification courses at University of St. Gallen in 2009 or 2010 or in a certificate course at mixed institutions in 2010 (Lorz and Volery, 2011). Additionally, he analyzed a control group at this university. His survey questions were mostly adapted from Liñán and Chen (2009). He found no significance in the "change for attitude toward behaviour, subjective norms and entrepreneurial intention" (Lorz and Volery, 2011, p. 73). The only significant impact could be observed for the PBC component. Taking his literature review into account, Lorz et al. (2013) further argued that the profile of students influences the effect of EE on EI.

2.3.3 Hypotheses II and III

Summarizing the research findings from this section, we identify two opposing theories in the current literature. The significance of these opposing study outcomes provides evidence for influence factors being more complex than just the participation in EE. With our research, we want to contribute to resolve these contradictory positions in literature. Therefore, our second hypothesis is:

Hypothesis 2: Entrepreneurial Education positively influences Entrepreneurial Intention.

Since we identify Ajzen's model to be the most suitable and most commonly used one for analyzing the impact of EE on the antecedents of EI (see: section 2.1), our study relies on this model for the final set of hypothesis. These are:

Hypothesis 3a: The individuals Attitude toward Behavior positively mediates the effect of Entrepreneurial Education on the participant's Entrepreneurial Intention.

Hypothesis 3b: The individuals Subjective Norms positively mediate the effect of Entrepreneurial Education on the participant's Entrepreneurial Intention.

Hypothesis 3c The individuals Perceived Behavioral Control positively mediates the effect of Entrepreneurial Education on the participant's Entrepreneurial Intention.

3 Methodology

Based on our extensive literature review, we apply a quantitative research design to test the hypotheses against empirical data. For research question one, Ajzen's theory is tested in a novel setting to enhance its external validity. Contingent on the results of the first hypothesis, a mediation analysis is applied to test our second and third hypotheses. In the following, the sample and data collection process as well as the regression models are described.

3.1 Sample

The setting for our survey was the Informatics Faculty of Technical University of Munich (TUM). The sample consisted of 66 participants, 33% of which were female. 59% of our sample participated in an EC that meets the criteria outlined in section 2.3.1. The remaining participants did not partake in the ECs, hence they are our control group. Most of the students studied Information Systems (55%), the second most frequent major was Informatics (29%). Further subjects included Data Engineering, Robotics, Games Engineering and IT Security. The average semester of our participants was 8.9, which is consistent with 88% currently pursuing a master's degree. Our sample consists mainly of students with German nationality (73%).

For this study, we have chosen an EC that complies with the criteria outlined in section 2.3.1. Software Engineering in Business Applications (SEBA, original in German: "Software Engineering für betriebliche Anwendungen - Masterkurs") is about technical web development in an entrepreneurial context. Students are to come up with an idea that they have to develop to a working prototype. Throughout the entire course, they have to keep the founding of a start-up in mind by creating a Business Model Canvas, Value Proposition Canvas and to pitch their idea to a jury of teaching assistants Matthes (2017). According to our course classifications in sec-

tion 2.3.1, Software Engineering for Business Applications (SEBA) falls into the category of stage one and two of the entrepreneurial process due to their practical orientation. We classify the content of the class as "entrepreneurial domains" and "entrepreneurial strategy". Due to the course's practical approach, the pedagogical method is classified as "active-applied".

3.2 Data Collection and Variable Operationalization

In November 2017, a structured questionnaire was distributed to collect the data. Administering an anonymous survey is a daunting task. First, mailing lists of lectures are inaccessible to students. Second, we anticipated a low response rate since our survey was not officially sent by any informatics chair. Due to these reasons we had to resort to an arbitrary selection of survey participants. Our personal network served as starting point to gather the initial data. Additionally, we spent half a day in the common space of the Informatics Faculty to randomly convince students to participate in our study. The survey was conducted in English.

In the questionnaire, only statistically validated items are included to assess the constructs of Ajzen's Theory of Planned Behavior. The questionnaire is administered once after the students have participated in the EC (ex-post analysis) and to the control group. From a methodological standpoint it is preferential to use longitudinal data (i.e. two data points for each individual before and after participating in the course), because this enables causal inferences. Lorz et al. (2013) and Von Graevenitz et al. (2010) further elaborated on weaknesses of studies using ex-post data and suggest to conduct quasi-experimental studies in entrepreneurship education research. This is further discussed in chapter 5. However, due to time-restrictions we confirm ourselves to a cross-sectional analysis, being well-aware of its restrictions with respect to causal inferences and external validity.

The survey assesses a total of five variables that are included in our regression model. For the operationalization of the latent variables Attitude toward Behavior (ATB), Subjective Norm (SN), Perceived Behavioral Control (PBC) and the level of Entrepreneurial Intention (EI), we adopt the items suggested by Liñán and Chen (2009). All four variables are assessed via a seven-point Likert scale, where a score of one refers to "absolutely disagree" and a score of

seven refers to "absolutely agree". The mean of the respective items of one variable represents the component score of that variable and is used in the statistical analysis. The dependent variable EI is assessed with six items and has a Cronbach's α of 0.93 (Cortina, 1993). The independent variables include ATB (5 items, Cronbach's α: 0.93), PBC (6 items, Cronbach's α: 0.88) and SN (3 items, Cronbach's α: 0.26). According to Hair (2010), an α-level of $\geq$0.7 is acceptable, which means that the measures EI, ATB and PBC have a very high reliability. Based on our data, the α-level for the variable SN is not sufficient. With respect to multicollinearity, all independent variables exhibit a variance inflation factor between one and ten. Hence, our statistical analysis is not affected by collinearity between the predicting variables. Table 3.1 summarizes the variable statistics.

Table 3.1: Variable statistics

Variables	Mean	Std. Error	α-level	VIF
EI	4.00	1.68	0.93	
ATB	4.82	1.63	0.93	1.84
PBC	3.78	1.35	0.88	1.59
SN	4.48	1.41	0.26	1.28

The final independent variable included in our model is whether students have participated in an EC complying with the criteria outlined in section 2.3.1. This variable is coded as a dichotomous variable (1: has participated, 0: has not participated). The multi-item questionnaire is randomized to eliminate answer biases (Warner, 1965). Additionally, we include questions to assess five control variables that were found to influence EI (Lorz and Volery, 2011; Oosterbeek et al., 2010; Pittaway and Cope, 2007; Solesvik, 2013). These are: degree (Master / Bachelor), study program (e.g. Information Systems), total number of semesters, gender and country of birth.

3.3 Regression Models

To test the hypotheses outlined in sections 2.2 and 2.3.3, two distinct regression designs are applied. We use a linear regression model to test H1a-c. A mediation analysis is conducted to test H2 and H3a-c.

In the linear regression model, the three latent variables of Ajzen's TPB are exogenous variables predicting the EI. Our null hypotheses for H1a-c are that neither of these variables predict EIs at a significant level.

For the second research question, we formulated the second hypothesis as well as three process-hypothesis H3a-c in section 2.3.3. Similar to the methodology applied by Zhao et al. (2005), we provided evidence for these hypotheses by means of a mediation analysis based on Baron and Kenny (1986). In a first step, we apply an ANOVA to identify whether the mean EI of students participating in the EC significantly differs from those students that have not participated in a similar course. The slope parameter of our dichotomous variable (course participation y/n) equals the difference in EIs across the experimental conditions (i.e. the "total effect"). In a second step, we decompose the total effect into a direct and an indirect effect. The indirect effect represents the part of the total effect explained by the mediator postulated in our hypothesis. The direct effect represents the part of the total effect explained by all competing mediators. Only if the Sobel Test indicates a significant indirect effect, a mediation is observed (Sobel, 1982). If the direct effect is not significant, the total effect is fully mediated by the proposed mediator. A significant direct effect indicates a partial mediation.

4 Results and Analysis

For our first research question, we regress EI on the three independent variables proposed by Ajzen's TPB. As shown in Table 4.1, we find that the explanatory power of the variables proposed by Ajzen is high ($F=91.18$, $p<.01$). The statistical analysis of the individual explanatory variables partially supports Ajzen's TPB (see: Table 4.2). ATB is positively and significantly related to EI ($b=.771$, $p<.01$). This supports our first hypothesis 1a. Hypotheses 1b suggests

that SN positively influence EI. Our data does not provide evidence for this hypothesis. However, SN exhibits a significant bivariate correlation with EI (r=.449, p<.01). Furthermore, EI was positively and significantly predicted by PBC (b=.249, p<.01). Thus, our findings support H1c.

Table 4.1: ANOVA

	Sum of squared errors	df	Mean square	F	Sig.
Regression	150.45	3	50.15	91.18	***
Residual	34.10	62	.55		
Total	184.56	65			

Table 4.2: Coefficients: EI $\sim$ ATB + SN + PBC

	Estimate	Std. error	t value	Pr(>|t|)	Signif. code
(Intercept)	-0.869	0.359	-2.420	0.018	*
ATB	0.771	0.076	10.102	<.001	***
SN	0.046	0.074	0.628	0.532	
PBC	0.249	0.086	2.902	0.005	**

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

In summary, the model fits the data well. It explains 90.3% of the variance, with adjusted R-squared being 80.6%. Figure 4.1-4.3 illustrate the correlation of the three components of Ajzen's TPB with the EI.

Figure 4.1: EI ∼ ATB

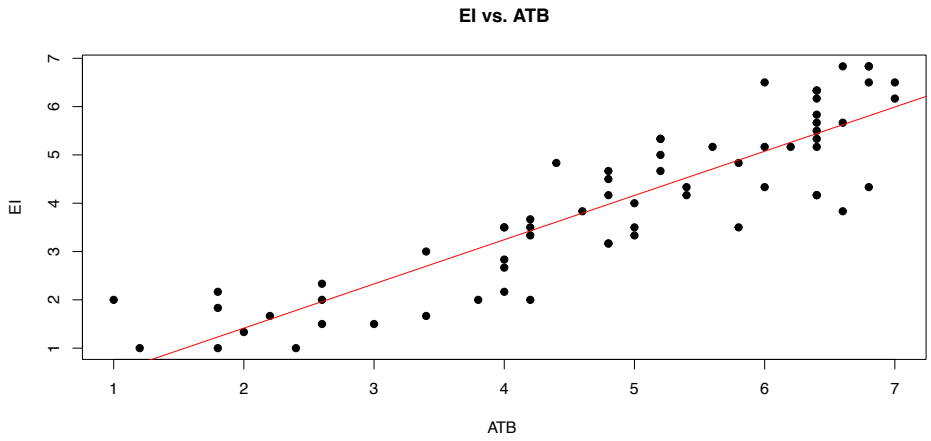


Figure 4.2: EI ∼ SN

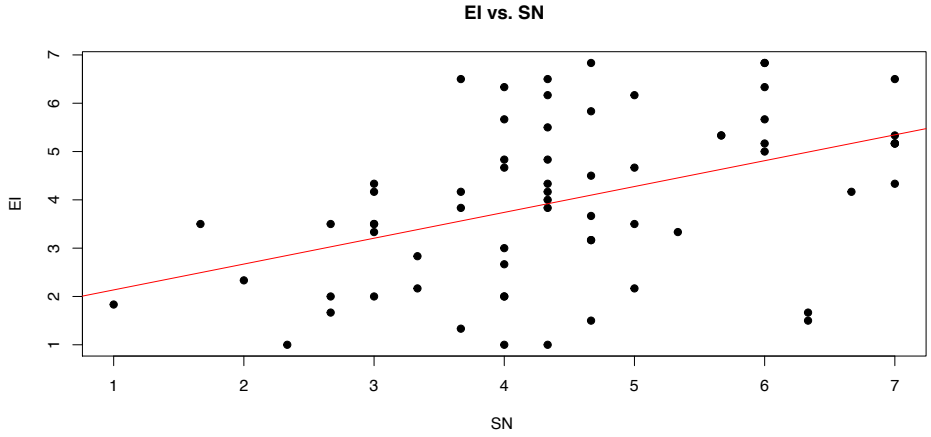
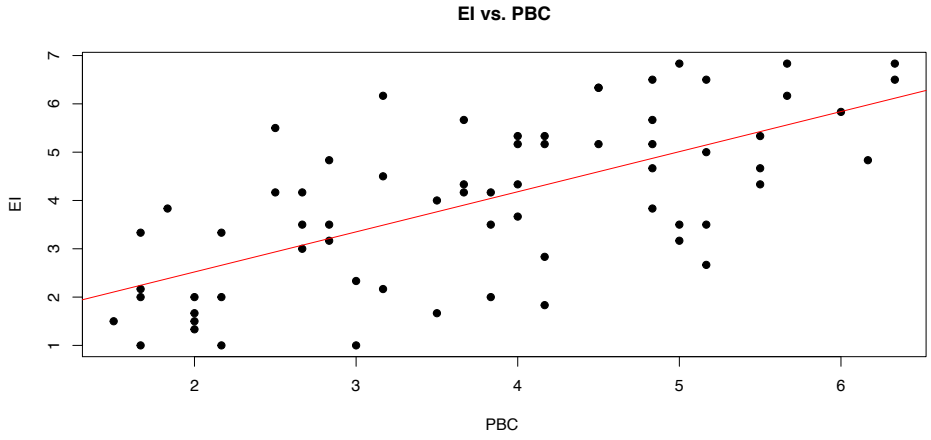


Figure 4.3: EI ∼ PBC



Our second research question aims at analyzing the effect of participating in ECs on EI (H2) and the mediating effect of the components of Ajzen's TPB (H3a-c). Including the ECs (SEBA) as the predictor variable yields a negative, non-significant effect on EI (b=-.122, p>.77). The results of the ANOVA are depicted in Table 4.2. Also the correlation matrix reveals no significant relationship between attending ECs and SN (r=-.34, p>.78), ATB (r=.02, p>.84) and PBC (r=.20, p>.10). These relationships are visualized in appendix 1. According to Baron and Kenny (1986), there is no effect to be moderated since no significant total effect can be observed. Thus, the indirect effects are not tested for their significance.

Table 4.3: Coefficients: EI $\sim$ SEBA

	Estimate	Std. error	t value	Pr(>|t|)	Signif. code
(Intercept)	4.0556	0.2828	14.339	<2e-16	***
SEBA	-0.1222	0.4195	-0.291	0.772	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The raw data as well as the regression analysis and outcomes are publicly available at:

https://github.com/lukasmohs/entrepreneurial-intention-analysis

5 Discussion

This paper finds further evidence for Ajzen's TPB and rejects the hypothesis that EE increases EI. The following section is dedicated to the limitations of our findings as well as their practical and theoretical implications. We also direct the attention to possible future research.

5.1 Limitations

Some limitations, methodological as well as practical, should be taken into account. As one important limitation, we identify our study to be of an ex-post research design. Using a purely cross-sectional dataset makes it difficult to differentiate between correlation and causality. Even though we tried to account for this problem by the selection of the control group to be very similar to the treatment group (study degree, current semester), we are aware that our research question demands a longitudinal or panel design (Lorz et al., 2013; Von Graevenitz et al., 2010). Unfortunately, this was impossible in the context of this study due to time constraints. Zhao et al. (2005) used matching in order to control for this problem as it was also recommended by Von Graevenitz et al. (2010). Other factors that might reduce the external validity of our results are that our research is limited to one university (TUM), one faculty (Informatics Faculty) and one course (SEBA).

Nevertheless, we apply many techniques of good research. Lorz et al. (2013) provided methodological improvements from which we incorporate those that are within the scope of this research project. First, we pursue a theory driven approach, which requires the development of the research question and hypothesis prior to developing the methodology and research design. Second, we thoroughly describe the EC in chapter 3 and provide a framework for its classification. This is required to make future research results comparable and reproducible. Finally, we use an advanced statistical model by introducing a mediation model in the context of the TPB. However, as our hypothesis 2 proves insignificant, a full mediation analysis renders superfluous.

5.2 Implications and Future Research

Our research has various implications on theory and practice of EE, which are outlined in the following.

With our first hypothesis, we contribute to Ajzen's Theory of Planned Behavior and reaffirm it. While our analysis shows that ATB and PBC positively influence EI, it provides little evidence

for an impact of SN. This finding is in line with the studies presented in section 2.2 and demonstrates once again that that Ajzen's TPB performs well in the entrepreneurship context and that it forms a solid basis for future research in this field. Studies that have been based on the TPB can be revalidated.

At the same time, this opens up the question if this underlying framework could be extended to further decompose the antecedents. Like Zhao et al. (2005) demonstrated in his model, analyzing input factors for entrepreneurial self-efficacy and EI, Ajzen's antecedents could be extended or tested against further influences.

Given the rejection of our second hypothesis, which claims to show the positive impact of EE on EI, we conclude that the exact interaction remains unclear. In section 2.3.2, we present the colliding positions in literature, which already raised the argument for new methodological approaches (Lorz and Volery, 2011; Von Graevenitz et al., 2010). The coexistence of significant positive and negative correlation in literature as well as our findings contributes to this argument.

Furthermore, Solesvik (2013) already named the potential difference in study degrees being responsible for the varying formation of EI when analyzing engineering and business students. Since the technical students in our study developed a different EI than, for instance, American MBA students, which were analyzed by Zhao et al. (2005), two possible implications can be drawn. On the one hand, the selection bias of entrepreneurial students for the corresponding business degree, which was already named by Von Graevenitz et al. (2010) and Lorz and Volery (2011), could lead to this difference in attitude. On the other hand, the course content and structure plays a more sophisticated role in the formation of EI. In section 2.3.1, we provide a first approach to classify future studies in order to make the research findings more comparable.

Our practical implications are dedicated to both: policy makers and future researchers. We outline the mismatch between current research findings that are not uniformly supporting the desired effect of EE and the situation in practice, which shows a substantial growth in the number of entrepreneurship programs. Institutions such as TUM, which incorporate and support forms of EE, should further investigate the effect on students and potentially align their programs. Among other scholars, Martin et al. (2013) underlined the relevance of this research for

policy makers to maintain the country's entrepreneurial spirit. Based on the research findings, governments can take appropriate measures to improve the EE (Solesvik, 2013).

6 Conclusion

The purpose of this paper was to understand how Ajzen's TPB explains the formation of EIs and the impact of EE on the formation of EIs.

For the first aspect, we summarized the literature and showed that the TPB is a useful framework to model the complex human behavior. Since the groundwork of Ajzen's TPB was first published in 1984 the model proved to be an extremely good and robust predictor of intentions. Building on this, we showed that the literature so far suggests that the model can be extended to the EI research. We made contributions to this field of research by using Ajzen's framework in a novel setting and provided evidence that partially reconfirms the TPB, since two out of three antecedents are significant predictors of EI.

By researching the second aspect, our goal was twofold. First, we investigated whether there is a correlation of EE and EI. Second, we wanted to understand the underlying mechanism by which such an effect would be conveyed. Based on the literature, we hypothesized that EE positively enhances EI. Furthermore, we hypothesized that TPB can be used in a mediation analysis with the model's antecedents as the mediators. Neither of these aspects were supported by our data. We were able to relate the identified insignificance to explanations in literature. Missing considerations of the context as well as an analysis of the perception of student's skills may lead to further research.

Another important direction for further research is the understanding of how entrepreneurship is learned. By providing empirical evidence for this aspect the research community contributes to develop best practices in EE and thereby to enable policy makers to encourage entrepreneurship on a large scale. As Kuratko (2005) has pointed out, this ultimately contributes to the economic and societal development of a country.

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Appendix

1 Visualized Effect of the Course Software Engineering for Business Applications on the Entrepreneurial Intention

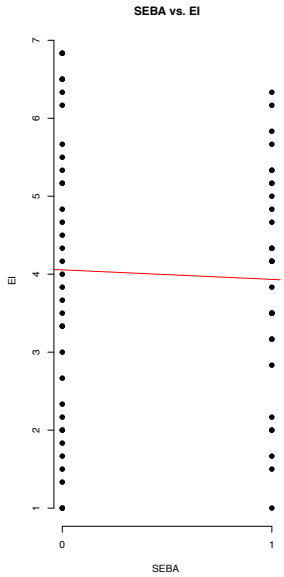


Figure 6.1: Scatterplot EI ∼ SEBA

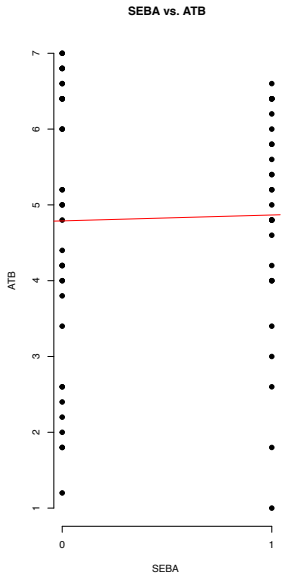


Figure 6.2: Scatterplot ATB ∼ SEBA

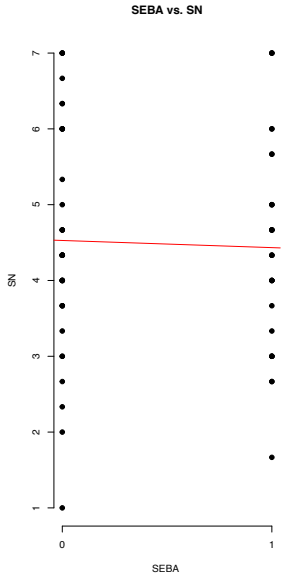


Figure 6.3: Scatterplot SN ∼ SEBA

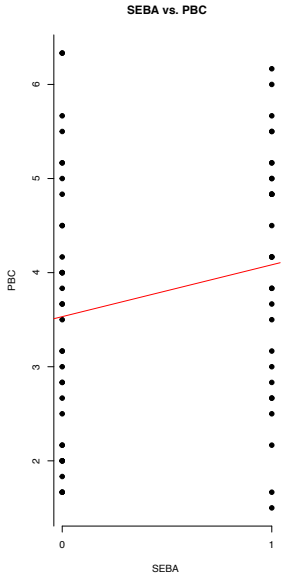


Figure 6.4: Scatterplot PBC ∼ SEBA

2 Questionnaire

This questionnaire is fully adapted from Liñán and Chen 2009 Liñán and Chen (2009).

Personal Attitude

11. Indicate your level of agreement with the following sentences from 1 (total disagreement) to 7 (total agreement).

	1	2	3	4	5	6	7
11.a- Being an entrepreneur implies more advantages than disadvantages to me	☐	☐	☐	☐	☐	☐	☐
11.b- A career as entrepreneur is attractive for me	☐	☐	☐	☐	☐	☐	☐
11.c- If I had the opportunity and resources, I'd like to start a firm	☐	☐	☐	☐	☐	☐	☐
11.d- Being an entrepreneur would entail great satisfactions for me	☐	☐	☐	☐	☐	☐	☐
11.e- Among various options, I would rather be an entrepreneur	☐	☐	☐	☐	☐	☐	☐

Subjective Norm

13. If you decided to create a firm, would people in your close environment approve of that decision? Indicate from 1 (total disapproval) to 7 (total approval).

	1	2	3	4	5	6	7
13.a-Your close family	☐	☐	☐	☐	☐	☐	☐
13.b- Your friends	☐	☐	☐	☐	☐	☐	☐
13.c- Your colleagues	☐	☐	☐	☐	☐	☐	☐

Perceived Behavioral Control

15. To what extent do you agree with the following statements regarding your entrepre- neurial capacity? Value them from 1 (total disagreement) to 7 (total agreement).

	1	2	3	4	5	6	7
15.a- To start a firm and keep it working would be easy for me	☐	☐	☐	☐	☐	☐	☐
15.b- I am prepared to start a viable firm	☐	☐	☐	☐	☐	☐	☐
15.c- I can control the creation process of a new firm	☐	☐	☐	☐	☐	☐	☐
15.d- I know the necessary practical details to start a firm	☐	☐	☐	☐	☐	☐	☐
15.e- I know how to develop an entrepreneurial project	☐	☐	☐	☐	☐	☐	☐
15.f- If I tried to start a firm, I would have a high probability of succeeding	☐	☐	☐	☐	☐	☐	☐

Entrepreneurial Intention

18. Indicate your level of agreement with the following statements from 1 (total disagree- ment) to 7 (total agreement).

	1	2	3	4	5	6	7
18.a- I am ready to do anything to be an entrepreneur	☐	☐	☐	☐	☐	☐	☐
18.b- My professional goal is to become an entrepreneur	☐	☐	☐	☐	☐	☐	☐
18.c- I will make every effort to start and run my own firm	☐	☐	☐	☐	☐	☐	☐
18.d- I am determined to create a firm in the future	☐	☐	☐	☐	☐	☐	☐
18.e- I have very seriously thought of starting a firm	☐	☐	☐	☐	☐	☐	☐
18.f- I have the firm intention to start a firm some day	☐	☐	☐	☐	☐	☐	☐

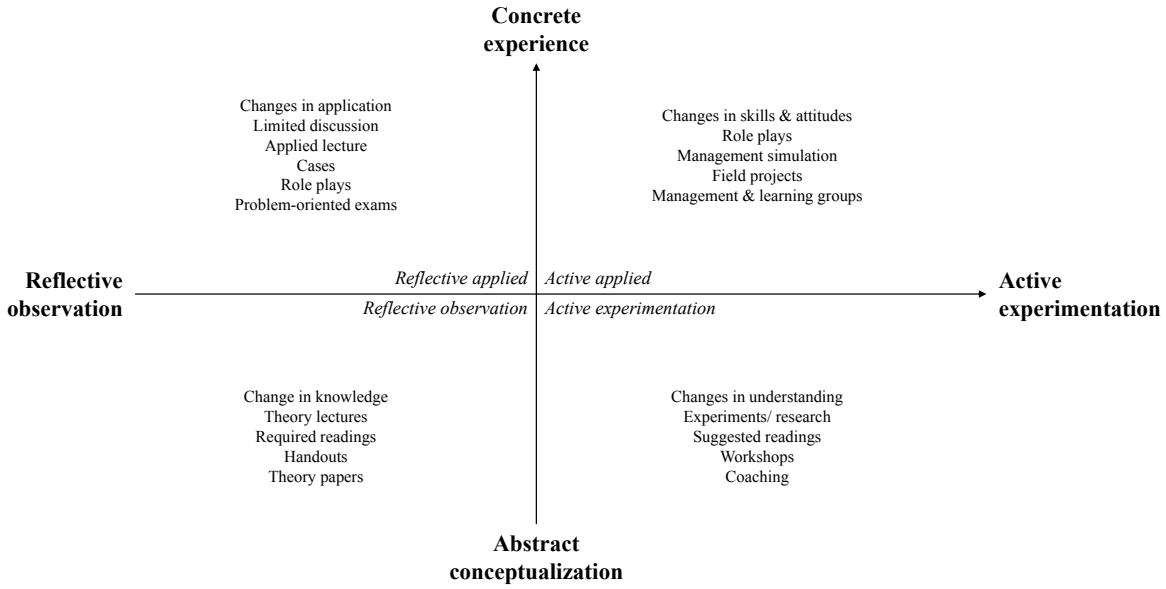
3 Survey Responses

Figure 6.5: Raw Survey Responses

ID	11a	11b	11c	11d	11e	13a	13b	13c	15a	15b	15c	15d	15e	15f	18a	18b	18c	18d	18e	18f	Degree	Study Program	Semesters	Gender	Country of Origin	Attended SEBA
1	4	4	5	5	2	1	3	6	4	3	5	5	4	4	1	1	3	3	5	4	Master	Information Systems	13	Female	Germany	yes
2	1	2	2	3	1	1	7	5	3	1	2	4	4	4	1	1	1	1	1	1	Master	Information Systems	10	Female	Austria	yes
3	5	1	2	3	4	7	6	1	2	1	2	2	1	1	2	2	1	1	2	1	Master	Information Systems	13	Male	Germany	yes
4	5	4	3	4	5	6	1	2	3	3	2	3	2	3	3	3	5	3	3	4	Master	Information Systems	9	Male	Germany	yes
5	6	5	6	5	4	6	4	7	4	5	5	3	4	4	5	5	6	5	5	6	Master	information systems	15	Female	Germany	yes
6	5	6	4	7	4	7	6	5	4	4	7	7	5	4	4	6	5	6	3	6	Master	Information Systems	10	Male	Germany	yes
7	6	7	7	6	6	6	7	4	3	5	5	7	6	7	2	6	6	6	6	6	Master	Information Systems	12	Male	Germany	yes
8	4	6	5	7	6	7	7	7	3	3	5	3	4	7	5	6	5	5	4	6	Master	Information Systems	10	Male	Germany	yes
9	7	6	7	7	6	4	7	7	5	5	4	5	6	4	5	6	5	5	7	6	Master	Information Systems	10	Male	Germany	yes
10	7	7	5	5	5	4	7	1	6	6	6	7	6	6	6	5	4	5	5	4	Master	Information Systems	10	Male	Germany	yes
11	3	5	6	4	2	3	1	5	3	4	5	6	6	6	3	2	4	4	4	4	Master	Information Systems	10	Male	Germany	yes
12	6	6	7	7	6	5	2	5	3	4	5	5	5	5	5	7	6	7	6	7	Master	Information Systems	10	Female	Germany	yes
13	4	7	7	7	7	2	6	7	6	6	7	6	7	2	2	7	7	7	7	7	Master	Information Systems	10	Male	Germany	yes
14	4	4	6	5	5	2	7	3	4	5	4	4	6	6	5	4	3	6	6	4	Master	Information Systems	11	Male	Germany	yes
15	6	7	5	7	5	1	3	5	3	4	3	3	3	6	4	5	5	3	5	4	Master	Informatics	12		Pakistan	yes
16	6	7	6	6	6	7	7	7	6	4	5	4	4	6	4	5	5	6	5	6	Master	Information Systems	9	Female	Germany	yes
17	1	3	4	3	2	5	3	4	1	2	4	2	2	2	1	3	2	3	1	2	Master	Information Systems	11	Male	Germany	yes
18	5	7	7	7	6	6	4	3	2	5	4	4	4	4	5	5	3	3	5	4	Master	Information Systems	11	Male	Germany	yes
19	6	3	3	4	4	1	7	7	3	2	2	6	3	3	1	3	2	2	3	2	Master	Information Systems	14	Male	Germany	yes
20	5	7	7	7	6	7	7	6	4	4	2	3	5	4	4	5	4	4	4	4	Master	Computer Science	13	Male	Germany	no
21	3	1	7	5	1	2	1	5	4	1	5	3	3	5	1	1	3	1	1	3	Master	Information Systems	13	Male	Germany	yes
22	6	6	6	6	5	5	5	5	2	3	6	3	4	5	3	5	2	4	2	5	Master	Information Systems	12	Male	Germany	yes
23	4	5	5	5	5	3	2	4	4	2	4	1	1	4	3	4	4	6	2	6	Master	Information Systems	11	Female	Germany	yes
24	5	5	6	6	5	3	1	7	3	4	2	2	1	3	5	4	5	4	2	5	Master	Information Systems	13	Female	Egypt	yes
25	4	3	6	5	3	2	7	5	4	4	4	4	3	5	2	3	3	5	4	5	Master	Information Systems	11	Male	Germany	no
26	1	1	1	1	1	1	3	4	1	1	1	1	5	1	1	1	1	1	7	1	Master	Information Systems	10	Male	Germany	yes
27	2	3	2	3	3	1	3	2	3	2	3	4	2	4	1	4	3	1	2	3	Bachelor	Information Systems	1	Male	Germany	no
28	5	6	7	7	5	7	3	3	4	4	7	5	4	5	6	5	7	7	7	7	Master	Data Engineering and Analytics	4	Male	India	no
29	2	3	3	3	2	5	7	7	2	2	1	1	2	4	2	1	2	1	2	1	Master	Informatics	7	Male	Germany	no
30	4	4	5	4	4	1	1	7	2	2	3	2	2	2	3	4	3	4	3	3	Master	Real-Time Computer Systems	7	Male	Germany	no
31	3	6	6	5	2	6	3	4	5	2	3	2	2	3	5	5	4	5	5	5	Master	Robotics	7	Female	Germany	no
32	4	4	2	3	4	3	7	2	4	1	1	1	2	7	5	1	7	1	2	2	Master	Robotics Cognition Intelligence	10	Male	Germany	no
33	3	2	2	2	2	5	7	7	2	1	1	1	2	5	1	2	1	1	4	1	Master	Informatics	7	Male	Germany	no
34	4	4	4	4	4	2	1	5	1	4	4	3	1	4	1	4	4	4	4	4	Master	Data Engineering and Analytics	6	Female	Ghana	no
35	1	1	4	1	2	1	1	1	2	3	5	5	4	6	1	1	1	3	2	3	Master	Data Engineering and Analytics	11	Male	Iran	no
36	6	7	7	7	7	4	7	2	4	1	3	6	5	5	2	4	4	6	4	6	Master	Information Systems	7	Male	Germany	no
37	3	4	6	6	2	4	7	1	4	3	5	3	4	4	2	2	2	2	1	3	Master	Information Systems	7	Female	Germany	no
38	7	7	7	7	7	7	7	7	5	6	4	5	6	5	7	7	6	6	7	6	Master	Information Systems	9	Female	Germany	no
39	6	6	6	6	6	7	7	4	5	3	5	3	4	4	5	5	5	6	5	5	Master	Informatics	1	Male	Ukraine	no
40	6	6	7	6	7	7	7	7	6	3	5	4	4	5	3	5	7	5	5	6	Master	Data Engineering and Analytics	1	Female	Mexico	no
41	7	7	7	7	7	6	6	1	3	2	4	3	3	4	7	7	7	6	5	5	Bachelor	Computer Science	5	Male	Albania	no
42	4	5	4	6	5	5	7	2	2	3	3	2	3	4	4	3	3	3	3	3	Master	Information Systems	10	Female	Germany	yes
43	1	2	1	1	1	1	3	3	2	4	4	1	1	1	1	1	1	1	1	1	Master	Informatics	5	Female	India	no
44	7	7	7	7	6	3	1	7	7	7	5	7	7	5	5	6	7	7	7	7	Master	Informatics	13	Male	India	no
45	2	6	6	6	4	1	6	7	5	6	4	5	6	4	2	3	3	4	2	5	Master	Information Systems	10	Male	Germany	yes
46	7	6	7	6	6	6	7	5	4	4	5	5	5	4	6	5	6	7	7	7	Master	Data Engineering and Analytics	9	Male	Egypt	no
47	7	7	5	6	7	3	5	6	6	6	6	5	7	6	5	6	6	6	5	7	Master	Information Systems	10	Male	Germany	yes
48	4	5	7	5	4	3	6	4	3	5	4	3	2	4	2	4	5	5	3	5	Master	Informatics	5	Male	Moldova	no
49	4	6	6	5	4	1	2	2	4	6	6	3	5	7	4	3	4	4	2	4	Master	Information Systems	8	Male	Germany	yes
50	4	7	4	6	6	7	7	7	4	5	5	6	7	6	2	5	3	5	6	5	Master	Information Systems	more	Female	Germany	yes
51	5	5	5	5	3	6	4	3	5	4	5	5	5	5	4	4	5	4	2	4	Master	Information Systems	9	Male	Germany	yes
52	3	2	2	3	2	1	5	6	3	1	1	1	1	3	1	1	1	1	1	1	Master	Informatics	7	Male	Germany	no
53	4	5	5	4	1	7	1	1	4	1	1	1	1	4	4	1	2	2	2	1	Master	Informatics	7	Male	Germany	no
54	4	6	3	7	4	1	7	6	3	2	3	3	3	5	3	4	5	4	5	6	Bachelor	Information Systems	4	Male	Germany	no
55	4	6	5	5	6	7	1	7	6	5	6	6	5	5	5	5	2	6	6	4	Master	It Security	11	Male	Germany	no
56	6	7	7	6	6	7	3	3	3	3	2	1	2	4	5	5	5	6	5	7	Master	Computational Science and Engineering	12	Male	Romania	no
57	6	6	7	6	7	4	4	4	2	3	4	2	5	6	6	6	6	6	4	6	Bachelor	Informatics	5	Female	Germany	no
58	5	5	5	6	5	7	7	7	5	4	4	3	3	5	6	4	7	5	5	5	Bachelor	Games Engineering	5	Female	Germany	no
59	1	1	3	3	1	6	3	1	2	1	1	1	4	1	2	2	4	1	1	3	Bachelor	Games Engineering	8	Inter/Diverse	Germany	no
60	7	7	7	7	5	6	7	5	5	6	7	7	7	6	7	6	7	7	7	7	Master	Robotics Cognition Intelligence	2	Male	Germany	no
61	7	7	7	6	6	2	7	2	2	2	2	1	1	1	4	2	2	6	4	4	5	Master	Informatics	1	Male	Syria	no
62	2	2	2	2	2	5	4	2	2	1	2	1	2	4	1	2	1	2	1	1	Master	Computer Science	14	Female	Germany	no
63	7	7	7	7	6	7	7	4	1	7	7	6	7	6	6	7	7	7	7	7	Master	Computational Science and Engineering	11	Female	Colombia	no
64	6	7	7	7	7	7	1	6	4	7	4	5	5	5	6	7	7	7	7	7	Bachelor	Informatics	6	Male	Israel	no
65	5	5	6	7	2	7	6	3	1	3	2	1	1	2	4	5	1	4	2	4	Master	Computational Science and Engineering	5	Male	USA	no
66	3	3	7	5	2	1	4	7	5	4	5	6	6	5	2	2	2	3	5	2	Bachelor	Information Systems	5	Female	Germany	no

4 Pedagogical Methods

Figure 6.6: Pedagogical methods adapted from Garavan and O' Cinneide (1994) and Randolph and Posner (1979)



5 Regression Analysis Implementation

```
library(dplyr)
library(car)


########    SETTINGS     #############
setwd("/Users/lukasmohs/Desktop/Innovation-Analysis/")
#adjust to directiory
data = read.csv("cleaned-responses.csv",sep=';')
summary(data)
data <- mutate(
        data, ATB = (X11a+X11b+X11c+X11d+X11e)/5
)
data <- mutate(
        data, SN = (X13a+X13b+X13c)/3
)
data <- mutate(
        data, PBC = (X15a + X15b + X15c + X15d + X15e + X15f)/6
)
data <- mutate(
        data, EI = (X18a + X18b + X18c + X18d + X18e + X18f)/6
)
data <- mutate(
        data, SEBA = ifelse(
        Attended.SEBA == 'yes', 1, 0
        )
)
data <- mutate(
        data, Entrepreneur = ifelse(
        Already.Entrepreneur == 'yes', 1, 0
        )
)

########     EFFECT OF EI on ACTION     #############
#Modeling effect of IE on Entrepreneur
fitIEonEntrpreneur <- lm(Entrepreneur ~ EI, data=data)
summary(fitIEonEntrpreneur)

########     EFFECT OF SEBA     #############
#Modeling effect of SEBA on IE
```

```
fitSEBAonEI <- lm(EI ~ SEBA, data=data)
summary(fitSEBAonEI)
plot(data$SEBA, data$EI, axes=FALSE, main="SEBA vs. EI",
     xlab="SEBA ", ylab="EI", pch=19)
axis(side=1, at=c(0:1))
axis(side=2, at=c(1:7))
abline(fitSEBAonEI, col="red")

#Modeling effect of SEBA on ATB
fitATB <- lm(ATB ~ SEBA, data=data)
summary(fitATB)
plot(data$SEBA, data$ATB, axes=FALSE, main="SEBA vs. ATB",
     xlab="SEBA ", ylab="ATB", pch=19)
axis(side=1, at=c(0:1))
axis(side=2, at=c(1:7))
abline(fitATB, col="red")

#Modeling effect of SEBA on SN
fitSN <- lm(SN ~ SEBA, data=data)
summary(fitSN)
plot(data$SEBA, data$SN, axes=FALSE, main="SEBA vs. SN",
     xlab="SEBA ", ylab="SN", pch=19)
axis(side=1, at=c(0:1))
axis(side=2, at=c(1:7))
abline(fitSN, col="red")

#Modeling effect of SEBA on PBC
fitPBC <- lm(PBC ~ SEBA, data=data)
summary(fitPBC)
plot(data$SEBA, data$PBC, axes=FALSE, main="SEBA vs. PBC",
     xlab="SEBA ", ylab="PBC", pch=19)
axis(side=1, at=c(0:1))
axis(side=2, at=c(1:7))
abline(fitPBC, col="red")


########     EFFECT OF AJZEN ANTECEDENT     #############
#Modeling effect of Ajzens antecedents on IE
fitAjzen <- lm(EI ~ ATB + SN + PBC, data=data)
summary(fitAjzen)
#plot(fitAjzen)
```

```
#Plot effect of ATB on EI
plot(data$ATB,data$EI, main="EI vs. ATB",
     xlab="ATB ", ylab="EI", pch=19)
abline(lm(EI ~ ATB, data = data), col="red")

#Plot effect of SN on EI
plot(data$SN,data$EI, main="EI vs. SN",
     xlab="SN ", ylab="EI", pch=19)
abline(lm(EI ~ SN, data = data), col="red")

#Plot effect of PBC on EI
plot(data$PBC,data$EI, main="EI vs. PBC",
     xlab="PBC ", ylab="EI", pch=19)
abline(lm(EI ~ PBC, data = data), col="red")
```