To what extent is the level of higher educational background reflected in the effectuational/causational decision-making process of novice entrepreneurs?

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ABSTRACT

Entrepreneurship is an evolving subject that is increasingly coming to the attention of researchers. More people are interested in the concept of successful new venture starting and its underlying principles. Decisions have to be made on a daily basis, regardless whether they are short-term or long-term. In the entrepreneurship literature, two dichotomous angles of decision-making have been introduced, namely causation and effectuation. An entrepreneur, who is acting like causation suggests, will set a certain goal, will expect predetermined returns, analyze competition, exploit knowledge and will focus on predicting an unpredictable future. An entrepreneur, who is acting like effectuation suggests, will start explore the means available first, will be willing to commit to an affordable loss, emphasize strategic alliances, exploit contingencies and ultimately seek to control an unpredictable future. Ever since the concept of effectuation has been introduced, researchers are interested in exploring and explaining the different dimensions that regard this concept. This research is aimed at creating value for novice entrepreneurs on how their higher educational degree pursued is influencing their decision-making in an effectuational or causational way, to in the end get more insight on entrepreneurial behavior. In this paper, highly educated German novice entrepreneurs were the main object of research. It has been found that the differences in educational degree (BA, MA, PhD) itself are not significantly related to decision-making style, however the background of study undertaken previously is. Therefore, there is indeed a significant difference in decision-making whether an entrepreneur has conducted a business related study or a non-business related study.

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Keywords

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1. INTRODUCTION

Entrepreneurship is an evolving subject that is increasingly coming to the attention of researchers. More people are interested in the concept of successful new venture starting and its underlying principles. As of recently, it is taught more in higher academic and applied science universities on a global scale, particularly in business management schools (Aldrich, 2012; Busenitz et al., 2003). However, can successful venture management be taught in higher education facilities, or is the decision-making that leads to success a process which is learned over time by the experiences the entrepreneur gains?

Organizations do not simply exist, they are built on the past decisions made by the entrepreneur who started them. Entrepreneurs have to make multiple decisions on a daily basis, including problem-finding and solution-finding (Dew, Read, Sarasvathy, & Wiltbank, 2008b). Consequently, entrepreneurship is an action (McMullen & Shepherd, 2006) that can be observed many times as an individual behavior (Bird & Schjoedt, 2009). The underlying theories and practices of mentioned problem and solution finding processes are taught in today's higher education facilities (Kolb & Kolb, 2005, p. 197). Entrepreneurial learning is a new practice that links both entrepreneurship and higher education (Moustaghfir & Sirca, 2010). Entrepreneurial learning can be described as believing in certain actions because of their previously caused positive outcomes (Minniti & Bygrave, 2001). Learning shapes the direction and is setting the overall tone of the business (Young & Sexton, 2003) when recognizing and acting on opportunities (Rae, 2006). Especially in small businesses, learning is an essential part of understanding how the business innovates, survives and grows with regards to the dynamic environment it operates in (Macpherson & Holt, 2007). Therefore, organizational learning is dependent of the decision-making and entrepreneurial behavior of the owner (Lans, Biemans, Verstegen, & Mulder, 2008) and is ultimately related to the decision-making processes of the entrepreneur. As Sarasvathy (2001a) outlines, there are two ways of decision-making processes, namely causational and effectual decision-making. While causation is a principle that rests on logical prediction, effectuation on the other hand can be summarized as the logic of control. The effectuation theory has presented a theoretical shift in the way entrepreneurship has been perceived for years. Due to the challenge that comes along with the novelty, few researches have tried to empirically test effectuation (Perry, Chandler, & Markova, 2012). Fisher (2012) highlights that effectual entrepreneurs embrace the unexpected whereas causation tries to prevent any form of unexpectedness, both pleasant and unpleasant. While causation is a concept that is known for a relatively long period of time, effectuation is an emerging topic that fostered the interest of multiple researchers across the globe for the last decade. According to Dew, Read, Sarasvathy, and Wiltbank (2008a), expert entrepreneurs tend to pursue a rather effectual approach in making decisions regarding their business. MBA students, however, tend to have a more causational approach.

In this paper, I empirically test the influence of educational degree on decision-making style. The length of the previous study undertaken by the (novice) entrepreneur determines the amount of expertise developed over time from education, with expertise being the main influencing variable of effectuation/causation (Fischer & Reuber, 2011). The research builds on the work from Dew et al. (2008a), who only focused on the comparison of MBA students with professional expert entrepreneurs. Therefore, I found the need to take a closer look at the outcome with regards to the difference in degree. Multiple researches (Arend, Sarooghi, & Burkemper, 2015; Dew et al., 2008a; Perry et al., 2012; Sarasvathy, 2001a, 2009; Sarasvathy & Dew, 2005), which build their work on Sarasvathy's original paper, outlined the need to further research in this exact topic of entrepreneurship and effectuation. Perry et al. (2012) outlined the need to gather data on the effectual behavior of novice entrepreneurs. As qualitative data gathering has been the first choice of research methods conducted (e.g. Sarasvathy (2001a), Dew et al. (2008a)], this research will gather its data by quantitative data research in order to fill the gap by conducting different methods. Also, Edmondson and McManus (2007) outline the need of quantitative data research in effectuation studies in addition to the already existing qualitative results, as problems might arise when only one over the other method is collectively used. Hence, the need is still there to take a closer look at the topic of choice.

This results in the following research question:

'*To what extent is the level of higher educational background reflected in the effectuational/causational decision-making process of novice entrepreneurs?'*

In doing so, a questionnaire will be send out to novice entrepreneurs, which founded and still lead their business for less than five years up to this point in time. Furthermore, the entrepreneurs will be considered in groups regarding their highest completed academic degree. This research is aimed at creating value for entrepreneurs in terms of decision-making correlated with effectuational or causational decision-making, to in the end get more insight on entrepreneurial behavior.

This paper proceeds as followed: Firstly, the theories of previous approaches in existing literature will be outlined briefly. The aim of this section is to define the key concepts dealt with and to give an overview of related research. After reviewing the literature, it is possible to draw several hypothetical outcomes. This will be followed by summarizing the methodology and data gathering methods used as part of this research. This part will contain the number of participants in the survey amongst novice entrepreneurs, as well as the key findings. Next, I will draw the results I found and outline the limitations of this research to keep in mind when interpreting the results and check the consistency of the survey in terms of reliability and validity. Finally, I will discuss how the findings relate to the literature and give a possible future outlook for further research about the topic on hand.

2. LITERATURE

Entrepreneurship, as we know and use it today, was first defined in the early 1930th by Joseph Schumpeter (1934). Many authors have built their work on the findings of Schumpeter, one being Sara Sarasvathy. Sarasvathy (2001a) was the first to outline the contradicting concepts named causation and effectuation, based on many other scholars that were collectively stated in the work of Brinckmann et al. and regard planned and intuitive approaches (Brinckmann,

Grichnik, & Kapsa, 2010). BeforeSarasvathy, researchers had only dealt with exploring the concept of causation and named it as such. She introduced four main subdimensions as part of both effectuation and causation, which contrast the decision-making style of one another. Werhahn and Brettel (2012, p. 1) argue "*effectuation can be understood as a business philosophy, which is reflected in the activities and behavior of the firm*".

2.1 Causation and Effectuation

2.1.1 Causation

Causation defines the traditional decision-making perspective of entrepreneurship according to the definition of Sarasvathy (2001a). Causational decision-making processes base their procedure on particular given effects and states of the environment and focus on selecting means respectively in order to create a desired outcome (Sarasvathy, 2001a). In other words, causation is a many-to-one approach (many means, one effect). The four main dimensions that embody causation, as defined by Sarasvathy (2001a, p. 259), include expected returns by (1) selecting the optimal strategies for expecting returns, (2) using competitive analyses in business environments, (3) exploit preexisting knowledge and (4) using future prediction measures in order to make appropriate decisions regarding the future of the business. Causation can be seen as the traditional decision-making perspective, which is derived from neo-classical micro-economics (Chandler, DeTienne, McKelvie, & Mumford, 2011). Hence, a critique is that causation works only when perfect knowledge is present and the business operates in an infinite time setting (Sarasvathy, 2001b). Due to the fact that the future is fundamentally unknowable (Knight, 1921), when a business cannot adopt to unanticipated environmental circumstances quickly, it loses competitiveness (M. E. Porter & Advantage, 1985).

2.1.2 Effectuation

Effectuational decision-making processes look at a given set of means with the outlook on possible effects that can be created with those means given (Sarasvathy, 2001a). In other words, effectuation is a one-to-many approach (narrow means, many effects), as entrepreneurs can choose to pursue strategies out of their means available and accomplishing one desirable step after the other. Thereby, the strategy of the business is not focusing on one big goal, but many small goals that may change the direction continuously along the process.

The four main dimensions that embody effectuation are (1) affordable loss, (2) strategic alliance, (3) exploitation of contingencies and (4) controlling an unpredictable future. The effectuator predetermines a loss, which he is willing to take, and experiments with one strategy, rather than taking only one option that is most likely to maximize returns. Effectuation is a logic of design, not a decision, with logic meaning an "*internally consistent set of ideas*" (Dew et al., 2008b, p. 43). Hence, effectual logic is non-predictive. Effectuation is present in every form of business venture possible, as it is regarding decision-making in activities like financing and marketing to innovation or supply (Augier & Sarasvathy, 2004; Berends, Jelinek, Reymen, & Stultiëns, 2014; Brettel, Mauer, Engelen, & Küpper, 2012; Evald & Senderovitz, 2013; Read, Song, & Smit, 2009; Wiltbank, Read, Dew, & Sarasvathy, 2009). According to Harms and Schiele (2012), dynamic environments and the span of physical distance contribute to effectuation as well. Theories in effectuation also point out the importance of networks (Coviello, 2006; Johanson & Vahlne, 2009; Styles, Gray, Loane, & Bell, 2006).

2.1.3 Combining effectuation and causation

Dimensions	***Effectuation***	***Causation***
#1 Approach	Driven by means	Driven by goals
#2 Selection criteria	Affordable loss	Expected returns
#3 Contingencies	Exploit contingencies	Exploit pre-existing knowledge
#4 Control	Non-predictive control	Predictive control
#5 Outcomes	Strategic Alliances	Competitive analysis
	(controlling unpredictable future)	(predicting uncertain future)

Table 1 - Effectuation & Causation

The five subdimensions (Table 1) make the contrast between effectuation and causation distinct. It has been found that entrepreneurs are most likely to use a combination of both effectuational and causational decision-making processes when operating their business (Berends et al., 2014; Harms & Schiele, 2012; Sarasvathy, 2001a, 2009). The ease of shift depends on the perceived culture of the country in which the entrepreneur operates in (Gelfand, Nishii, & Raver, 2006; Hopp & Stephan, 2012). Nevertheless, the dimensions acknowledge the individual importance of the entrepreneur in regards to an international, constant development (Andersson, 2000; Matlay, Andersson, & Evangelista, 2006).

Bottom line, a clarification must be made that neither effectuation, nor causation is a better approach or concept than one another, they are dichotomous (Wiltbank, Dew, Read, & Sarasvathy, 2006).

2.1.4 The effectuator vs. the causator

Although both effectuation and causation are dichotomous, the following will outline the contrast in behavior and action from one another, in order to understand the underlying actions needed for the evaluation of the questionnaire of this research. While both concepts have been briefly sketched previously, the following section gives a rundown of the conceptions in execution.

According to Sarasvathy (2001a) and Chandler et al. (2011), the effectuator predetermines a loss, which he is willing to take, and experiments with one strategy, rather than taking only one option that is most likely to maximize returns (causator). The effectuator uses alliances and pre-commitments to control an uncertain future while the causator uses analytical decision model strategies to predict the future. Thirdly, the effectuator exploits contingencies as they occur, while the causator uses preexisting knowledge, resources and expertise to predict the final outcome. Lastly, effectuators are acting to "*the extent that we can control the future, we do not need to predict it*". Causators, on the other

hand, are acting "*to the extent that we can predict the future, [so] we can control it*" (Sarasvathy, 2001a, p. 252). The effectuator sees the world open and rarely considers opportunities as given or outside his control (Dew et al., 2008b). Perry et al. (2012) make one subdimension based on Sarasvathy's work very clear and distinct, namely beginning with a given set of means when dealing with effectuation instead of dealing with a given set of goals (causation). Means deal with three key questions, namely "Who I am", "What I know" and "Who I know" (Figure 1). They consequently establish the entrepreneur himself with all the attributes that make him an (1) individual human being, (2) his competencies, experience and education, (3) as well as

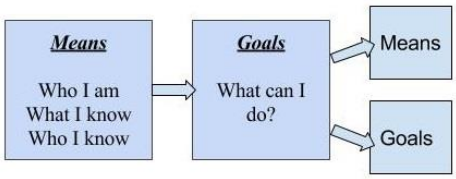

Figure 1 – Means vs. Goals

his close contacts (family, friends, co-workers). Figure 1 is part of a bigger framework, which can be found in Appendix 10.1, however Figure 1 highlights the main aspects needed for comprehension of the means vs. goals dimension.

The constraints of effectuation and causation were proven by Chandler et al. (2011, p. 376) who identified a negative relation of uncertainty and causation and a positive of uncertainty and effectuation. The research developed a sound measure of each "*by providing evidence supporting the reliability and validity […] of these measures*".

My research will take all subdimensions of effectuation and causation into consideration, as one might show to be more affected by educational background than the other. This outcome will help to test the research question and hypothesis of this research paper.

2.2 Entrepreneurial education

At first, the difference between entrepreneurial education and entrepreneurship education has to be distinguished. With entrepreneurial education, I refer to the higher educational degree pursed by the individual entrepreneur at an academic and applied science university (Bachelor, Master, PhD). Entrepreneurship education, on the other hand, refers to preexisting education in the field of entrepreneurship due to attitudes and skills obtained in a course or study program (Bae, Qian, Miao, & Fiet, 2014). I make a distinction because entrepreneurial education is possible without entrepreneurship education, as the entrepreneur does not necessarily have to undertake a business-related study or participate in entrepreneurship courses in order to start a venture.

Starting with entrepreneurial education, it has been stated in literature (Dew et al., 2008a) that expert entrepreneurs tend to make decisions on an effectual basis, while students who just completed their MBA have a causational approach. Baron (2009), however, critiqued the empirical analysis behind this research, stating that the study is lacking credibility as it neglects explanation for why expert entrepreneurs might think differently (e.g., age or education) (Arend et al., 2015). The main factor considered in the research by Dew et al. is experience, which explains the differences in decision-making behavior of both groups compared. Also Fischer and Reuber (2011) found that effectuation research main variable of choice is expertise. This one variable justifies the usage of effectual decision-making processes in theories of hypothetical start-ups only. Expertise is specific knowledge that is accumulated over time (Clark, 2008). In other words, the more education one pursues, the more one shifts from causal to effectuational (Figure 2). This is also displayed in the findings of Dew et al. as expert entrepreneurs tend to build their effectuational decision-making on expertise, which is a factor that MBA students lack. Figure 2 displays the hypothetical change in decision-making style, based on the assumptions from Fischer and Reuber (2011) and Clark (2008). With the accomplishment of a higher degree, time passes and experience is gained throughout that specific period of time. Therefore, the higher the entrepreneurial education, the more effectuational behavior should be present.

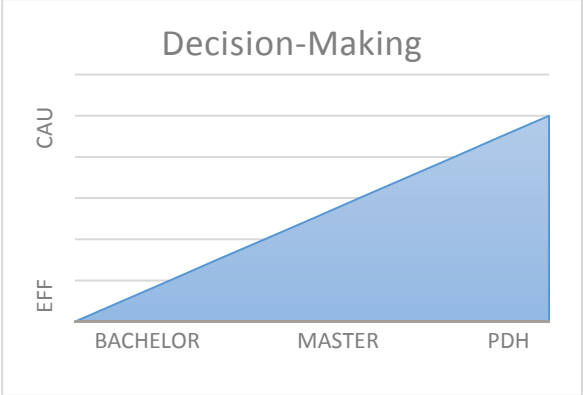

Figure 2 – Decision-making by degree / Own interpretation of the literature

Fletcher, Loane, and Andersson (2011) found that the reason for a causal reasoning of many business students is the restrictions in their environment (e.g. mindset). Just like Arend et al. (2015, p. 646) found in their research, every entrepreneur has the ability to act effectually, but only few do. However, it cannot be said much about the differences of entrepreneurial behavior with regards to the educational degree (education) yet, as there is no research present yet (Arend et al., 2015).

Next, entrepreneurship education will be taken into consideration. There are many studies in the literature on entrepreneurship learning and the therefore resulting entrepreneurial intentions (Bae et al., 2014; Bridge, O'Neill, & Cromie, 1998; Martin, McNally, & Kay, 2013; Pittaway & Cope, 2007). The studies only refer to entrepreneurship learning, outlining a current interest in people taking entrepreneurship courses and the strategies which they pursue from those. Despite, there are only few in itself who take the variable of education itself into consideration and question its entrepreneurial intent or the resulting decision-making process behavior. As Arend et al. (2015, p. 646) concluded in their recent study, a research gap still exists in terms of backup research to manifest the current findings and build up on existing knowledge. The authors recommend more independent scholars and more comparison work to shrink the knowledge gap and gain more insight on entrepreneurial behavior and decision-making processes towards one of the two leading directions.

Consequently, I will take the research of Dew et al. one step further by exploring differences in educational degree, namely Bachelor of Arts/Sciences, Master of Arts/Sciences or PhD. The entrepreneurs that are part of this study are novices and started their businesses within the last five years. As experience is therefore not given to a great extent, it will be interesting to see whether the tendency towards one or the other decision-making style varies with the degree pursued by the entrepreneur.

2.3 Entrepreneurial learning

According to Huber (1991, p. 89), "*an entity learns if, through its processing of information, the range of its potential behaviours is changed*". Entrepreneurial learning can be defined as a continuous process (Mumford, 1991) which is able to foster and develop the new knowledge generated in order to effectively start and manage new ventures (Politis, 2005). The continuous process is displayed in Figure 3, which draws an s-curve to demonstrate the relation between learning and experience (Wright, 1936), which is outlined as a key factor for effectuation.

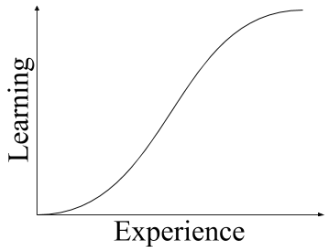

Figure 3 – Learning Curve

The skills necessary to be able to make high quality decisions are stored in each individual's minds, memories and routines (Dew et al., 2008b). Entrepreneurs are action oriented individuals and, therefore, their learning is dependent on the reflection of actions they take (Boud, Cohen, & Walker, 1993; Rae & Carswell, 2000). Learning through experience is a continuous, yet informal and unconscious process (Cope & Watts, 2000; Marsick & Watkins, 2001) and has been especially proven true for entrepreneurial learning (Murphy & Young, 1995). The ability to maximize knowledge when experiencing learning events is crucial for the entrepreneur and will determine the success of the company (Deakins & Freel, 1998, p. 153). Busenitz et al. (2003) also found that the growing trends of entrepreneurs are going towards the direction of networking by a growing internal base of culture and knowledge, due to constantly rising exchange. This learning factor would match the strategic alliances dimension of effectuation as it demonstrates effectuational decision-making in this dimension.

As McCauley, Ruderman, Ohlott, and Morrow (1994) found, four factors have been the main drivers of entrepreneurial learning, namely (1) support and guidance, (2) external interaction, (3) internal communication and (4) task characteristics. Those were, however, only found in large organizations. Lans et al. (2008) took those drivers further and outlined the main drivers for small businesses, which are both (1) external and (2) internal communication, as well as (3) freeing oneself from other tasks and responsibilities to make time for networking and reflection. As a consequence, the entrepreneur might find it difficult to step back as he is part in every activity the business executes. Studies on innovative an environmental behavior of small businesses concluded that time invested in experimenting results motivated reflection and learning experiences (Lepoutre & Heene, 2006). Lans et al. (2008) also outlined that tasks in business environments are completely dependent on the person who executes them, in this case the entrepreneur himself. Besides the fact that entrepreneurial learning is dependent on the environment in which the learner operates, the environment is shaped by the entrepreneur at the same time respectively. Consequently, relations between entrepreneurial learning and the environment of the entrepreneur are not static, but actively changing and adapting at all times. This gives the opportunity to not only create a business, but to also create an environment in favor of the business.

2.4 Research hypothesis

As already exposited prior, effectuation and causation are dichotomous concepts, which are both used interchangeably in businesses on a daily basis. However, novel entrepreneurs might tend to prefer the one over the other, or even a mix of both, when dealing with a certain situation. The educational level pursued beforehand might influence this event (Figure 2).

Causation is defined as planning and prediction, relationships base on experience and can be causally reasoned by facts (Dew et al., 2008a; Read et al., 2009). Universities support causal thinking as a matter of scientific research methods taught at those higher education facilities (Perry et al., 2012). This leads me to the first hypothesis that entrepreneurs with the highest education possible tend to think more causal than entrepreneurs who pursued lower educational degrees (**H1**). On the other hand, the variable of expertise should not be neglected when drawing a hypothesis about possible behavior (Dew et al., 2008a; Fischer & Reuber, 2011). Therefore, it could also be the case that the more education an entrepreneur pursues, the more expertise he gains and is therefore acting more effectuational (**H2**). This makes **H1** and **H2** distinct from one another, as they do not measure the opposite. It could be the case that they do not influence each other, as effectuation and causation can still be used in mixed form.

One control variable that could affect the decision-making of an entrepreneur is the type of previous gained education. Whether an entrepreneur has pursued a business administration degree or graduated in an entirely different major might influence effectuation and/or causation. It can be expected that entrepreneurs with a business administration background tend more towards causal decision-making, due to the fact that they have the knowledge and tactics that come along with a curriculum of predictions and methodology (Perry et al., 2012; Sarasvathy, 2009) (**H3**). On the other hand, entrepreneurs who have pursued a degree in a major that focuses less on formal business (e.g. music, art or engineering) will prefer effectuation over causation, as they have never had the opportunity to learn the steps of various business models that predict causal outcomes (**H4**). Again, the hypothesis do not measure the exact same outcome reversed, as a combination of usage in decision-making style is possible.

Lastly, it has to be considered that one of the dimensions of effectuation/causation Sarasvathy (2001a) explains might be more influenced by higher education than the other. Considering the means vs. goals dimension (see Figure 1), a higher education might affect the means an entrepreneur sees as available to a greater extent and develops a better understanding for (his) means in general (**H5**) (Read &

Sarasvathy, 2005). Consequently, he would act more effectuational in senses of means (Brettel et al., 2012; Read et al., 2009).

H1: Entrepreneurs with the highest educational degree will be the most causal.

H2: Entrepreneurs with the highest educational degree will be the most effectuational.

H3: Entrepreneurs with an educational background in business administration will tend to more causal decision-making.

H4: Entrepreneurs with a non-business background will tend to effectuational decision-making.

H5: Entrepreneurs who are highly educated prefer to look at possible means over goals.

3. METHODOLODY

In order to be able to answer the research question of this paper, data of entrepreneurs with different educational degrees had to be gathered by using quantitative research methods, as the literature lacks different research methods (as stated before). The mentioned entrepreneurs have to be higher educated, meaning successfully graduated some form of higher scientific institution or university (BA, MA, PHD). Furthermore, considered entrepreneurs have to be owner of their start up for less than five years (<5). The selection is made due to the gap in literature found and regard German entrepreneurs only. Therefore, a questionnaire was created, by Alsos (2014). The questionnaire contains questions regarding the measurement of effectuation and causation within each of the five dimension.. The survey of this research will ask ten questions, five for causation and five for effectuation in order to prevent survey fatigue, which can be defined as the time and effort a respondent has to put into the survey (S. R. Porter, Whitcomb, & Weitzer, 2004).. Lastly, the questions of the survey will be answered based on Gelfand et al. (2011) and Likert (1932) scale, which both measure tightness and looseness.

3.1 Data Sample

A total of 130 entrepreneurs filled out the survey and took y part in this research voluntarily. From the overall number of participants, a total number of 61 subjects was unusable for the study, which left 69 to continue the research with. The overall number of female entrepreneurs (25; 36.2 %) is significantly smaller than the number of male entrepreneurs (44; 63.8%). It can be concluded, that around 1/3 of the entrepreneurs are female and 2/3 are male. The age span of the participants lies between 20-59 years, with a mean of 31.58 (SD = 7.51). Considering the educational degree, 47.8% had completed a bachelor degree, 44.9% a master degree and 7.2% a PhD. The participants were selected based on their appearance in online start-up networks, networking groups on social media portals Facebook and LinkedIn, incubators and personal contacts. The participants all engage in different markets, with service sector being the most with a number of 20 entrepreneurs. Next to this, 49.3% of the respondents have taken a business related study in their prior education. From all the entrepreneurs conducting the survey, 39.6% has heard of the term effectuation before. Solely entrepreneurs with German heritage were taken into consideration to get a more reliable and valid outcome.

3.2 Data collection

Because of the limited time-frame of this research, the survey ran for a period of five weeks (36 days). All participants filled in an online survey, created via Google Forms. The questionnaire was sent via email, posted into novice entrepreneurship forums or sent through direct messages on social media. The voluntary participation was equal for every participant and without prior knowledge of the aim of the study, in order to prevent biased results. A total of approximately 2000 entrepreneurs were contacted, from which 130 responded. This equals a response rate of 6.5%. Although the analysis of the survey is conducted in English, the questionnaire has been created in German to prevent confusion amongst its participants. Therefore, the original questionnaire by Alsos (2014) has been translated by five native speakers and been overlooked and checked by a native German professor as well. This step was done very carefully to prevent any sampling or measurement errors from translation. However, the step was necessary, as English is not the native language of German entrepreneurs in general. The variables in the questionnaire are composed based on related topics in the literature in order to verify findings from the theoretical background. After the introduction of the questionnaire, the participant is filling in 54 questions in total, from which 7 are optional and the participant does not have to fill in information if not desired. The research I conduct is part of a larger research, therefore more testing variables are in the questionnaire, which could in the end be used as control variables if desired. The second set of 10 questions is most important for this research and measures the effectuational and causational behavior of the entrepreneur by asking one questions about each dimension per concept (Appendix 10.2.1). Therefore, the answer scale (Likert, 1932) includes seven possible answers and ranges from entirely disagree over mostly disagree, somewhat disagree, neutral, somewhat agree, mostly agree to entirely agree. Two times five questions measure each dimension of both effectuation and causation. The closing outcome of the observations will result in a data pool of quantitative data.

3.3 Data analysis

In order to use the data that has been collected by the questionnaire, it must be processed and analyzed. Kothari (2004) outlines a four-step method that allows processing data. The framework includes the steps editing, coding, classification and tabulation. During the editing step, data are scanned in order to identify unanticipated errors. During the second step, coding, all data are matched with a certain function. The third step, editing, allows organizing data into categories, which make the distinguishing easier. Lastly, during the tabulation phase, data is processed and ready for the final analysis by making the data easier to read. This method will be used when analyzing the data for this research.

In order to analyze the data gathered, the statistical program SPSS version 22 will be used for assessment. The independent variable of the study is higher educational degree, while the dependent variable is effectuation or causation.

Since the Alsos (2014) scale was translated to German for the purpose of this research, it was necessary to run an exploratory factor analysis on the questionnaire, in order to test whether the constancy and the validity remains intact

(see results and Appendix 10.3). Therefore, the analysis of the 10 questions regarding effectuation and causation was conducted via SPSS. The outcomes require a Kaiser-Meyer-Olkin (KMO) of minimum 0.7 and a Bartlett's test with a significance <0.05. With an Eigenvalue of 1 and a suppression point of 0.3, two factors need to be outlined (effectuation and causation). The created Scree Plot is supposed to draw the 2 factors as well. Lastly, the rotated component matrix should outline that both 5 question-sets correlate with one factor each.

For all analyses, a p-value of 0.05 was used to test the hypotheses and a Cronbach's alpha of >0.7 in order to test the internal consistency of the questionnaire (Field, 2013; Darren George, 2003), which was already tested and confirmed by Alsos (2014).

3.3.1 Dependent: Effectuation and Causation

The dependent variable in this study is the use of effectuation and causation (either or both). When I compare means during the analysis part, a higher mean shows more tendencies of the entrepreneurs towards the dependent variable tested. The Cronbach's alpha of the survey data are 0.774 for causation and 0.808 for effectuation (Appendix 10.5). Cronbach's Alpha is most commonly used to measure internal consistency (reliability) of questionnaires that use the Likert scale. Both effectuation and causation are internally consistent (>0.7), according to Cronbach's Alpha. Next, the Shapiro-Wilk test outlines normality when the significance is larger than 0.05. Appendix 10.6 shows that effectuation and causation are both normally distributed based on all educational degrees. They also do not correlate (Appendix 10.6.1.1). Concluding, the Shapiro-Wilk test shows no statistically significant deviations from a normal distribution for neither case. I will also check the acceptable ranges of skewness (-1 to 1) and kurtosis (-2 to 2) (D George & Mallery, 2010).

3.4 Control Variables

In order to prevent the influence of various random variables on the result of this research, control variables have been inserted. The control variables in the questionnaire education, year of founding the company, owning the company were used to filter the data in the beginning to follow the selection criteria of this study. Other variables, like sex, age or type of study can be used in order to control the outcomes as well. Age was therefore classified into 4 categories, 1 (20-30), 2 (31-40), 3 (41-50 and 4 (>51). A one-way MANOVA analysis was conducted to reveal further possible influenced of the control variables on effectuational and causational decision-making. A MANOVA test determines the differences between independent groups on various independent variables (Field, 2013). The results (Appendix 10.5) show that for effectuation the only variable that might influence the outcome is gender ($F = 8.48$, $p = 0.005$). For causation, gender is significant ($F = 8.269$, $p = 0.006$) as well as education ($F = 6.241$, $p = 0.004$). The variable gender could therefore influence the outcome of the research. Education, on the other hand, will be taken into consideration respectively as the key variable of the research.

4. ANALYSIS

4.1 Exploratory factor analysis

Firstly, an exploratory factor analysis was conducted to test the validity of the effectuation/causation questionnaire. The Kaiser-Meyer-Olkin (KMO) scored a 0.76 (<0.7) and is therefore significant. Furthermore, the Bartlett's test is significant as well ($df = 45$; $p>0.001$). With an Eigenvalue of 1, two factors were generated, which explain 54.42% of the total variance in all cases extracted. In the Scree Plot (Appendix 10.3), the two factors that are greater than an Eigenvalue of 1 are visible. The rotated component matrix outlines moderate-to-strong correlations between component 1 and the five effectuation question, as well as component 2 and the 5 causation questions. Consequently, the questionnaire is consistent and useable for the ongoing and continuing analysis.

4.2 Descriptive statistics

In table 2, one is able to find the five dimensions of this research with both the causational and effectuational factor. The mean and the standard deviation (here referred to as SD) can be found for each individual factor and the combination of both factors of the dimension. Appendix 10.9 holds a correlation matrix for the individual variables amongst each other. Noteworthy are the positive correlations between the just causation and just effectuation and negative correlations between both causation and effectuation. From that can be concluded, that the tendency to one factor results in less tendency towards the other factor. Also, neither effectuation nor causation correlates with education or business-related backgrounds (Appendix 10.9.1 & 10.9.2).

Table 2 - Ex ante overview - 5 dimensions

	(N = 69)	**Mean**	**SD**
	Decision-Making	0.98	1.92
	Causational	4.55	1.01
	Effectuational	3.56	1.32
Dimension	Approach	1.65	2.60
#1	***Goals***	5.13	1.39
	Means	3.47	1.85
Dimension	Selection criteria	0.78	2.50
#2	***Expected Return***	4.88	1.45
	Affordable Loss	4.10	1.69
Dimension	Unexpected contingencies	-0.87	2.31
#3		3.34	1.39
	Pre-existing knowledge	3.43	1.67
	Exploit contingencies		
Dimension	Outcomes	1.00	2.36
#4	***Competitive analysis***	4.73	1.46
	Strategic alliances	3.73	1.69
Dimension	Control	1.59	2.70
#5	***Predictive***	4.68	1.54
	Non-predictive	3.08	1.68

4.3 Ex ante analyses

Generally, the question remains whether highly educated German entrepreneurs tend to use either effectuation or causation more or less. The results of the t-tests can be found in table 2. A higher mean in the table draws the general tendency towards the one decision-making style over the

other. The first paired sample t-test (Appendix 10.8) outlines a statistically significance between effectuational and causational decision-making (t=4.254, p<0.001). German novice entrepreneurs seem to use more causational decision-making with a mean of 4.55 (SD = 1.01) than effectuational decision-making with a mean of 3.56 (SD = 1.32). An additional t-test (Appendix 10.7) shows that higher education seems to have more influence on causation (t = 17.103, p<0.001) than effectuation (t = 9.969, p<0.001). Multiple paired t-tests were run in order to determine the use of a causal or effectual dimension by German novice entrepreneurs (Table 2). The results can be found in Table 2 and Appendix 10.8. The table outlines that German novice entrepreneurs tend to use more causal decision-making in general, however in the individual dimensions as well. Starting with the first effectuation and causation dimension, German novice entrepreneurs tend to strive more for goals 5.13 (SD = 1.39) than means 3.47 (SD = 185). The t-test shows a statistically significant difference in the first approach (t = 5.267, p<0.001). German novice entrepreneurs also decide rather because the returns they can expect 4.88 (SD = 1.45) and are less willing to commit to affordable loss 4.10 (SD = 1.69). The t-test shows statistical significance (t = 2.598, p = 0.11). In terms of the fourth dimension, outcomes for their business, German novice entrepreneurs analyze competition 4.73 (SD = 1.46) more than building on strategic alliances 3.73 (SD = 1.69). The t-test outlines a statistically significant difference in dimensions (t = 3.524, p<0.001). In terms of control, German novice entrepreneurs use more predictive control 4.68 (SD = 1.54) than non-predictive control 3.08 (SD = 1.68). The result outlines a statistically significant difference in the fifth dimension (t = 4.900, p<0.001). Only for the third dimension, exploiting competencies, German novice entrepreneurs seem to use the effectuational dimension exploit contingencies 3.43 (SD = 1.67) more than exploiting pre-existing knowledge 3.3.4 (SD = 1.39). The t-test, however, shows no statistically significant difference in using the one decision-making style over the other (t = -0.312, p = 0.756).

4.4 Hypothesis 1

H1: Entrepreneurs with the highest educational degree will be the most causal.

A one-way ANOVA analysis was conducted in order to compare the three means of the different educational degrees with causation (Appendix 10.10). The means were compared between groups, whereas a higher mean is outlining a higher use of causation of that specific group. Entrepreneurs who pursued a bachelor degree had a mean of 4.85 (SD = 0.81). Entrepreneurs who pursued a master degree had a mean of 4.22 (SD = 1.03). Entrepreneurs who pursued a PhD had a mean of 4.64 (SD = 1.66). The ANOVA F-test showed statistical significance between groups (F = 3.264, df = 2, < = 0.045). Therefore, I can conclude that a significant difference is indeed present between groups. The graph in Appendix 10.10 showed a significant fall at Master. The rise in mean to PhD, however, has to be taken carefully, as the n was very low (n = 5). The boxplot (Appendix 10.6.1.1) shows a significant outlier and the test of normality (Appendix 10.6) skewness to the left (-1.73) (Altman & Bland, 1996; D George & Mallery, 2010).

To take the research a step further, I put Master and PhD together into one category and compared it to Bachelor. Therefore, I compare lower (Category 1, BA) with higher (Category 2, MA, PhD) degree. I did put the two categories Master and PhD together in order to avoid the problem of skewness, which is now acceptable (-0.549) (Altman & Bland, 1996). I conducted a two sample t-test (Appendix 10.10.1). The mean of category 1 4.85 (SD = 0.80) is higher than the mean of category 2 4.28 (SD = 1.12). The t-test shows statistical significance (t = 2.406, df = 67, p = 0.0095), however the significance outlines the opposite result from the hypothesis. Causation becomes lower with higher educational degree in category 2. Therefore, the hypothesis can be declared as not true.

4.5 Hypothesis 2

H2: Entrepreneurs with the highest educational degree will be the most effectuational.

A one-way ANOVA analysis was conducted in order to compare the three means of the different educational degrees with effectuation (Appendix 10.11). The means were compared between groups, whereas a higher mean is outlining a higher use of effectuation of that specific group. Entrepreneurs who pursued a bachelor degree had a mean of 3.606 (SD = 1.35). Entrepreneurs who pursued a master degree had a mean of 3.55 (SD 1.17). Entrepreneurs who pursued a PhD had a mean of 3.40 (SD = 2.22). The ANOVA F-test did not show statistical significance between groups (F = 0.054, df = 2, p = 0.949). This might be because of the much higher standard error of PhD (SE = 0.993). When we look at the boxplot (Appendix 10.6.1.2) we see a significantly skewed outcome for PhD with a median at around 2.3 that deviates far from the mean. The linear trend plot, however, outlined a negative relation of degree and effectuation.

To take the research a step further, I put Master and PhD together into one category and compared it to Bachelor. Therefore, I compare lower (Category 1, BA) with higher (Category 2, MA, PhD) degree. I conducted a two-sample t-test (Appendix 10.11.1). The mean of category 1 3.60 (SD = 1.35) is higher than the mean of category 2 3.53 (SD = 1.32). The t-test, however, does not outline statistical significance (t = 0.226, df = 67, p = 0.411). The linear relation for both categories is also outlined to be negative.

From this analysis, it can be concluded that high educational degrees do not lead to the most effectuational decision-making. In fact, the higher the degree, the less effectual the entrepreneur acts. However, the sample needs a bigger population sample in order to show statistical significance.

4.6 Hypothesis 3

H3: Entrepreneurs with an educational background in business administration will tend to more causal decision-making.

A two-way ANOVA was conducted in order to compare the educational background in business administration and higher educational degree with causation (Appendix 10.12). The means were compared between groups, whereas a higher mean is outlining a higher use of causation for that specific group. The mean for entrepreneurs with business background 4.74 (SD = 0.97) was higher than the mean of entrepreneurs without business background 4.23 (SD = 1.03). The Levene's test outlined equal variance as it was not significant (F = 0.059, p = 0.809). The t-test was statistically significant (t = 2.04, df = 67, p = 0.0225) and outlined that there is indeed an

relation between educational background and causation. In the descriptive table are the means given for the different educational backgrounds. A descending relation can be identified for business administration background. The significance table outlined no statistically significance for both main effects, business background ($F = 0.331$, $df = 1$, $p = 0.567$) and education ($F = 0.551$, $df = 2$, $p = 0.073$).

From these results I can suppose my hypothesis to be true, entrepreneurs with an educational background in business administration are indeed tending to more causal decision-making.

4.7 Hypothesis 4

H4: Entrepreneurs with a non-business background will tend to effectuational decision-making.

A two-way ANOVA was conducted in order to compare the non-business background with educational degree and effectuation (Appendix 10.13). The means were compared between groups, whereas a higher mean is outlining a higher use of effectuation for that specific group. The mean for entrepreneurs with business background 3.48 ($SD = 1.28$) was lower than the mean of entrepreneurs without business background 3.71 ($SD = 1.40$). The F-test showed no statistical significance between groups. Additionally, a two sample t-test was conducted to compare background education with effectuation. The Levene's test outlined equal variance as it was not significant ($F = 0.18$, $p = 0.673$). The t-test was not statistically significant ($t = -0.677$, $df = 67$, $p = 0.25$) and outlined that there is no relation between non-business background and effectuation. The descriptive table also outlined no statistical significance for one of the two main effects.

Also, this hypothesis has been tested whether the two categories created, 1 and 2, have influence on background education (Appendix 10.13.1). However, no statistical significance could be detected between groups.

It can be concluded from the means and from the plot that entrepreneurs with a non-business background will tend to a more effectuational decision-making, however the difference is not statistically significant.

4.8 Hypothesis 5

H5: Entrepreneurs who are highly educated prefer to look at possible means over goals.

The OLS regression analysis (Appendix 10.14) shows that there is no statistically significant relation between higher educated entrepreneurs and the preference of means ($F = 0.006$, $p = 0.937$). The OLS regression analysis also showed no statistically significant relation between higher educated entrepreneurs and the preference of goals ($F = 0.921$, $p = 0.341$). Putting this outcome differently, no distinct direction derives from the independent variable high education towards choosing the possible means available or the planned goals when making decisions. It can be concluded that high education of German novice entrepreneur is not associated with neither the preference of means nor goals based decision-making approach.

5. DISCUSSION AND CONCLUSION

5.1 Discussion

This research was aimed at giving insight of the decision-making processes of novice entrepreneurs; and whether they tend towards decision-making based on the concepts of causation or effectuation as a consequence of their previously pursued higher educational degree.

As outlined in the literature review, effectuational and causational decision-making is dependent on learning and experience. What was striking here most was that no clear direction towards one or the other decision-making style was detectable from the literature review only. Whereas the factor of experience suggested to become more effectuational over time, the factor of learning suggested to become more causational. When a novice entrepreneur has undertaken a study beforehand, it might influence his decision-making to one way or the other. The type of study and the length, and with length come accomplished degrees, are therefore important factors to consider.

When contacting potential entrepreneurs that could participate in the study, I experienced the enormous power of social media. Within one week, I was able to almost triple the responses. The entrepreneurs were more willing to contribute when contacted and addressed personally. Moreover, I was able to check their educational background on social media platforms, as many reported them there. This assured the entrepreneur to fit the niche I was looking for more, when I contacted him/her. Additionally, this eventually reduced the need to reject responses when sorting entries in the end. Also, the environment in online forums was supportive towards university research. Therefore, I would highly advise further researchers to take this into account when dealing with a specific niche of participants.

Quantitative research is fairly novice at the field of effectuation and causation. The results gave interesting insights, and the sample size was overall big enough ($n > 50$) (Field, 2013). The different groups of educational degree vary in size, as the number of PhD entrepreneurs for instance is $n = 5$. However, according to Field and Hole (2002), the difference in means compared is not important to the extent that one has to compare all various outputs created by the analysis, including graphical outputs and distribution plots. For this research, I did not only look at the significance level, but also at the graphical outputs in order to analyze and conclude the outcomes (Cleveland, 1985; Mosteller & Tukey, 1977)

5.1.1 Hypotheses outcomes

The first two hypotheses did not outline the results as expected. Neither effectuation nor causation was the highest in combination with the highest educational degree (H1, H2). Regardless that the sample of PhD's was relatively small compared, the outcome did not change when I put the two highest educational degrees together into one variable. Hypothesis 1 outlined the exact opposite to what I hypothesized. Namely, the lower the educational degree, the more causational an entrepreneur becomes. The results were statistically significant. Hypothesis 2 should have come to a similar result as H1, however the results were not statistically significant. I assume that both Bachelor degree students tend to prefer the one or the other concept based on different factors (like educational background H3 and H4). What I can say, though, is that the relation between educational degree and both effectuation and causation is a negative one. It can be assumed that effectuation and causation, being the dichotomous concepts that they are, are more equally used as education is gained. This, however, is just an assumption

based on the trend of means of both of them and requires further investigation.

Hypotheses 3 and 4 both showed interesting outcomes, namely that the educational background itself determines the preference of decision-making style. Hypothesis 3 outlined that entrepreneurs who had undertaken a business-related study previously, indeed tend towards causal decision-making. This finding aligns with the theoretical framework of Perry et al. (2012) that the causality of business administration background is shown in decision-making style of entrepreneurs that have been educated in such a way previously. Hypothesis 4 drew a similar result, namely that non-business background entrepreneurs tend to a more effectuational approach. Although the results were not statistically significant, I can assume the hypothesis to at least not be false anyways. The graph (Appendix 10.13) outlines a very clear and distinct positive relation between effectuation and non-business background with regards to higher educational degree. When looking at the combined categories 1 and 2 in Appendix 10.13.1, one is able to see a clearer, linear relation in both ways, positive and negative. The graphs outline that effectuation and non-business background are positively related, whereas business background and effectuation are negatively related. The graphs have the same origin and then divide into opposite directions. In order to test the outcome to be statistically significant, one has to look further into this subject of study.

Hypothesis 5 was rejected, as I could not identify any statistical significance. It seems that education does not determine the preference of means towards goals, although the literature would have indicated otherwise (Brettel et al., 2012; Read & Sarasvathy, 2005; Read et al., 2009). It might be that the final decision is dependent on the entrepreneurs' preferences of planning after all. The table created for the ex ante analyses (see 4.3, Table 2) previously outlined a tendency towards means over goals as well. From that table, one can see the clear tendency towards every causational dimension, expect for the 3rd dimension, where entrepreneurs tend to exploit contingencies more than relying on pre-existing knowledge. A possible reason supported by literature could be the capability to maximize the ability and competence to learn from events (Deakins & Freel, 1998) and therefore not stagnate and stick to plans set previously in the much more fast pace business environment nowadays (Cliff, 1998).

For Hypothesis 1, 2, 3 and 4, I took the research one additional step further and conducted a two-sample t-test again with two variables. I put Master and PhD together into one variable in order to test whether the outcomes change or eventually become significant when they had not been significant before. One reason for this was the small n = 5 for PhD, although I already pointed out previously that the differences in means are not as relevant according to Field and Hole (2002). An additional reason was the relatively strange graph I got when comparing educational degree and causation (Appendix 10.10) and the Bonferroni test showing statistical significance for both Bachelor and Master in combination (p = 0.04), but neither with PhD (p = 1). I performed a test of normality for the new created two categories (Appendix 10.10.2) to reassure the normal distribution of both for continuing with parametric tests. Both categories were indeed normally distributed. The outcomes of the two new created categories did not come to a different result than the previously conducted analysis did, however the results were displayed in more clear and straight linear relations. This gave me reassurance that the variable of PhD was indeed not misleading any results, like Field and Hole (2002) suggested.

After the statistical analyses, namely the ex ante analyses and the empirically tested hypotheses, one factor seemed striking the most. Education seems to have more significant influence on causation in general than it does on effectuation. Generally speaking, the combination of both concepts seems, at least when considering the means, the common practice amongst entrepreneurs. The general mean for causation was 4.55 and for effectuation 3.56. This means that still causation is a concept that is more thoroughly used amongst German entrepreneurs, however not solely causation, otherwise the mean would be closer to the value of 7.

5.2 Conclusion

To conclude where I started, the research question of this paper was *'To what extent is the level of higher educational background reflected in the effectuational/causational decision-making process of novice entrepreneurs?"*. After the finished research, it can be concluded that the completed educational degree itself is not significantly influencing the decision-making of novice entrepreneurs in the one way or the other. What was striking more with regards to higher education was the actual subject of study undertaken (see **H3** & **H4**). I came to the conclusion that entrepreneurs who had a background in business administration showed more tendency towards causal decision-making than entrepreneurs who came from a different background. A possible reason for this could be the theoretical, causal approach of business studies and higher education in general (Andersson, 2000; Fletcher et al., 2011), with entrepreneurship simply being a business-related subject after all.

5.3 Scientific relevance

The research by (Sarasvathy, 2001a) has observed decision-making processes on American entrepreneurs. Ever since her research, which was truly inspiring further researchers in that field, the need to gather more international data to compare has been given. Arend et al. (2015), Perry et al. (2012) and Chandler et al. (2011) all engaged in validation studies and gave necessary remarks for further investigation. The need for quantitative research in the field of effectuation was addressed during this research. It also provided more insight into differences in education, split by degree. By empirically creating a link between effectuation, causation and education, this research filled a big gap in the literature, as it measured links that have not been measured beforehand. Novice entrepreneurs open an entire new viewpoint on both concepts of effectuation and causation, especially with learning and education as influencing constancies.

5.4 Practical relevance

When studying business administration, students often get the impression that models are universally applicable and the world is black and white because of what has been taught during the courses. Text-books, lectures, studying and all the other instances that come along with higher education still rely on the concepts of causation (Fletcher et al., 2011). Effectuation is a topic, which has been brought attention to for less than ten years. This research made an important contribution to the work-in-progress that effectuation still is.

It showed that it is indeed a fairly complex concept, which has to be looked at from various different angles. Additionally, this research gave insights into the perceived behavior of German entrepreneurs and is therefore valuable on a country-level as patterns might be overserved based on different cultures. German entrepreneurs can take the results of education towards decision-making into account, also when hiring employees that are responsible for making crucial decisions in businesses. Lastly, international companies can benefit from the insight in decision-making based on former education and even culture when selecting the right people for a job.

6. LIMITATIONS

Most academic research is based on one original paper and research, namely Sarasvathy (2001a). This paper is based upon the research available, taking into consideration that the field of effectuation is relatively new and more research in this field still has to be conducted yet, which is a factor that I mentioned multiple time throughout my research paper.

Moreover, the kind of venture one entrepreneur starts might affect the choice in decision-making style. This can be independent of the educational degree pursued in advance (Sarasvathy, 2001a) or influenced by a business or non-business related study. Moreover, with regards to the work of Arend et al. (2015) and Baron (2009), the combination of different entrepreneurial attributes (e.g., age, selection, life history, experience and education) might also effect the choice for one or the other decision-making style. This might be another topic for further investigation. Additionally, the data pool contained German entrepreneurs only, hence the results might not be representative for every entrepreneur, as different variables maybe also reflect in the decision-making (e.g. culture, well-being of the country, etc.). Mentioning this fact, education changes from country to country, therefore studies that take this background into consideration will be insightful but have not been established yet. Consequently, the results might not be applicable for all entrepreneurs worldwide, with all higher education pursued in advance.

In terms of quantitative research, I was dependent on the contribution of many novice entrepreneurs. During the time period of hosting the survey, I was confronted with the difficulty of participation. Many entrepreneurs, who were contacted via official business email addresses first, reported back that they had difficulties figuring out what to make of this. The response rate was below 1% after the first 6 weeks of running the survey. Only in the last week before closing the survey, entrepreneurs were contacted more personally via social media. The response rate and interaction increased significantly. It was possible to almost triple the responses in one week. Therefore, I would highly advise further researchers to take this into account when dealing with a specific niche of participants.

7. RECOMMENDATIONS FOR FURTHER RESEARCH

Since qualitative data research is not the data gathering method of choice, further research should be conducted using this method. According to Perry et al. (2012, p. 841), "*similar types of procedures and analytical techniques*" could be outlined in the experimental researches of the main empirical effectuation articles. Consequently, different procedures and techniques should also be conducted for further research. It is advisable to take the power of social media into consideration, when dealing with a niche (e.g. young entrepreneurs).

Furthermore, it would also be of interest to look at the differences of educational degree for (expert) entrepreneurs, which lead their business for longer than five years (>5). There might still be differences in approach with regards to the education possessed, although the important variable of expertise is existing, which is aimed at influencing effectuational decision-making. However, as the main findings of this research suggested, (non-)business education background could also be influencing expert entrepreneurs when operating and making decisions in their companies.

Therefore, I would lastly advise to focus further research on the implications that (non-)business education has on decision-making in ventures in general, as well as the possible future outlooks that can be gathered from those insights.

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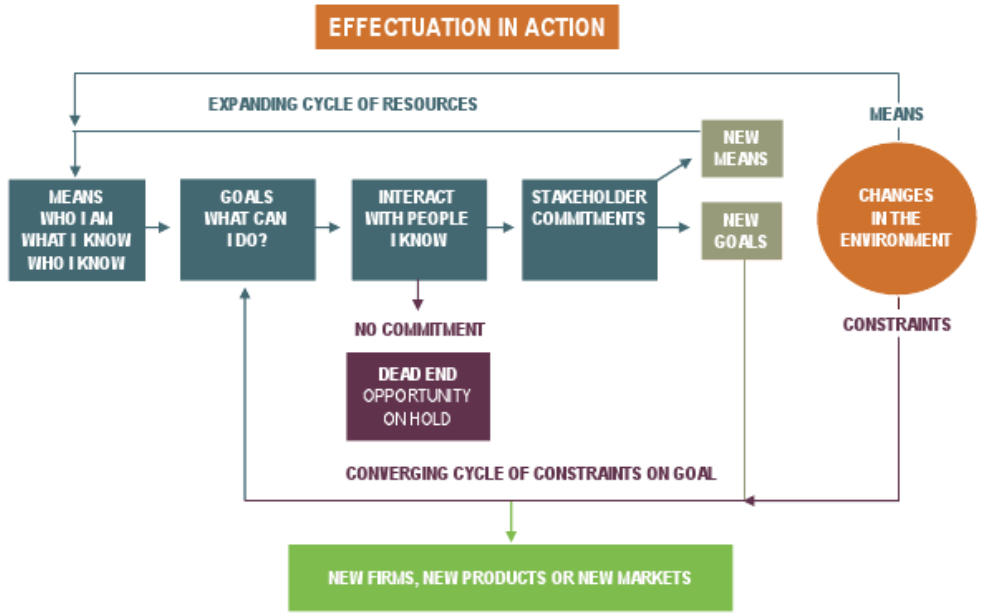
10. APPENDIX

10.1 Effectuation in action

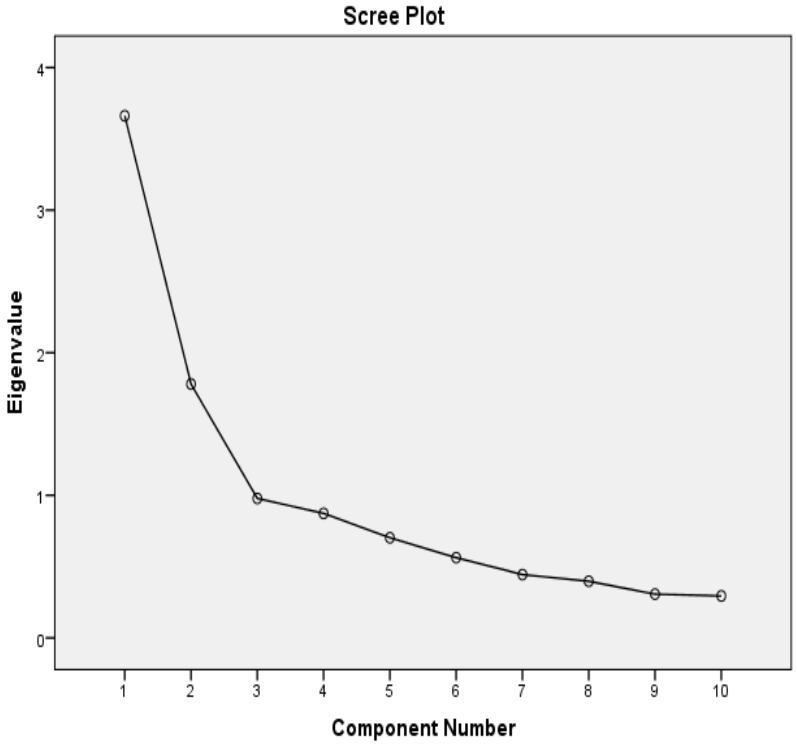


10.3 Factor Analysis

Correlation Matrix[a]

		Caus_1	Caus_2	Caus_3	Caus_4	Caus_5	Eff_1	Eff_2_affloss	Eff_3	Eff_4	Eff_5
Correlation	Caus_1	1,000	,328	,401	,458	,279	-,269	-,162	-,264	-,291	-,318
	Caus_2	,328	1,000	,181	,409	,481	-,186	-,265	-,095	-,156	-,248
	Caus_3	,401	,181	1,000	,356	,202	-,037	,016	,020	,039	-,120
	Caus_4	,458	,409	,356	1,000	,567	-,170	-,150	-,237	-,117	-,301
	Caus_5	,279	,481	,202	,567	1,000	-,237	-,184	-,276	-,116	-,395
	Eff_1	-,269	-,186	-,037	-,170	-,237	1,000	,574	,391	,227	,404
	Eff_2_affloss	-,162	-,265	,016	-,150	-,184	,574	1,000	,496	,358	,487
	Eff_3	-,264	-,095	,020	-,237	-,276	,391	,496	1,000	,476	,616
	Eff_4	-,291	-,156	,039	-,117	-,116	,227	,358	,476	1,000	,558
	Eff_5	-,318	-,248	-,120	-,301	-,395	,404	,487	,616	,558	1,000
Sig. (1-tailed)	Caus_1		,003	,000	,000	,010	,013	,092	,014	,008	,004
	Caus_2	,003		,069	,000	,000	,063	,014	,219	,100	,020
	Caus_3	,000	,069		,001	,048	,382	,448	,435	,375	,164
	Caus_4	,000	,000	,001		,000	,082	,110	,025	,169	,006
	Caus_5	,010	,000	,048	,000		,025	,065	,011	,171	,000
	Eff_1	,013	,063	,382	,082	,025		,000	,000	,030	,000
	Eff_2_affloss	,092	,014	,448	,110	,065	,000		,000	,001	,000
	Eff_3	,014	,219	,435	,025	,011	,000	,000		,000	,000
	Eff_4	,008	,100	,375	,169	,171	,030	,001	,000		,000
	Eff_5	,004	,020	,164	,006	,000	,000	,000	,000	,000	

a. Determinant = ,035



KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,760
Bartlett's Test of Sphericity	Approx. Chi-Square	214,052
	df	45
	Sig.	,000

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,662	36,617	36,617	3,662	36,617	36,617	2,928	29,276	29,276
2	1,780	17,803	54,420	1,780	17,803	54,420	2,514	25,144	54,420
3	,978	9,783	64,203						
4	,873	8,730	72,933						
5	,702	7,023	79,956						
6	,563	5,628	85,584						
7	,444	4,439	90,023						
8	,397	3,970	93,993						
9	,307	3,065	97,058						
10	,294	2,942	100,000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component	
	1	2
Caus_1		,653
Caus_2		,640
Caus_3		,653
Caus_4		,805
Caus_5		,696
Eff_1	,653	
Eff_2_affloss	,772	
Eff_3	,794	
Eff_4	,697	
Eff_5	,773	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Component Transformation Matrix

Component	1	2
1	,781	-,625
2	,625	,781

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

10.4 Cronbach's Alpha

10.4.1 Cronbach's Alpha for Causation

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,744	,743	5

Item Statistics

	Mean	Std. Deviation	N
Caus_1	5,130	1,3923	69
Caus_2	4,884	1,4505	69
Caus_3	3,348	1,3914	69
Caus_4	4,739	1,4618	69
Caus_5	4,681	1,5482	69

Inter-Item Correlation Matrix

	Caus_1	Caus_2	Caus_3	Caus_4	Caus_5
Caus_1	1,000	,328	,401	,458	,279
Caus_2	,328	1,000	,181	,409	,481
Caus_3	,401	,181	1,000	,356	,202
Caus_4	,458	,409	,356	1,000	,567
Caus_5	,279	,481	,202	,567	1,000

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Caus_1	17,652	18,083	,502	,296	,701
Caus_2	17,899	17,916	,484	,281	,708
Caus_3	19,435	19,426	,375	,199	,745
Caus_4	18,043	16,219	,646	,446	,645
Caus_5	18,101	16,769	,536	,397	,688

10.4.2 Cronbach's Alpha for Effectuation

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,808	,809	5

Item Statistics

	Mean	Std. Deviation	N
Eff_1	3,478	1,8599	69
Eff_2_affloss	4,101	1,6903	69
Eff_3	3,435	1,8746	69
Eff_4	3,739	1,6947	69
Eff_5	3,087	1,6868	69

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Eff_1	14,362	30,176	,504	,357	,799
Eff_2_affloss	13,739	29,490	,631	,441	,760
Eff_3	14,406	27,627	,649	,452	,753
Eff_4	14,101	31,357	,511	,347	,794
Eff_5	14,754	28,688	,686	,506	,743

Inter-Item Correlation Matrix

	Eff_1	Eff_2_affloss	Eff_3	Eff_4	Eff_5
Eff_1	1,000	,574	,391	,227	,404
Eff_2_affloss	,574	1,000	,496	,358	,487
Eff_3	,391	,496	1,000	,476	,616
Eff_4	,227	,358	,476	1,000	,558
Eff_5	,404	,487	,616	,558	1,000

10.5 Influence of Control variables

Between-Subjects Factors

		Value Label	N
Age_Cate	1,00		35
	2,00		28
	3,00		5
	4,00		1
Bus_Adm	1	Ja	44
	2	Nein	25
Edu	1	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	33
	2	Master of Arts/Master of Science, Diplom (oder gleichwertig)	31
	4	PhD/Dr.	5
Sex	female	female	25
	male	male	44

Tests of Between-Subjects Effects

Dependent Variable: EFF

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	49,428[a]	21	2,354	1,579	,097
Intercept	232,600	1	232,600	156,037	,000
Age_Cate	1,282	3	,427	,287	,835
Bus_admi_study	2,061	1	2,061	1,383	,246
EDU_New3	1,231	2	,615	,413	,664
Geschlecht	12,641	1	12,641	8,480	,005
Error	70,062	47	1,491		
Total	997,960	69			
Corrected Total	119,490	68			

a. R Squared = ,414 (Adjusted R Squared = ,152)

Tests of Between-Subjects Effects

Dependent Variable: CAUS

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	30,559[a]	21	1,455	1,707	,064
Intercept	544,918	1	544,918	639,144	,000
Age_Cate	5,979	3	1,993	2,338	,086
Bus_admi_study	1,134	1	1,134	1,331	,255
EDU_New3	10,642	2	5,321	6,241	,004
Geschlecht	7,050	1	7,050	8,269	,006
Error	40,071	47	,853		
Total	1503,200	69			
Corrected Total	70,630	68			

a. R Squared = ,433 (Adjusted R Squared = ,179)

Multiple Comparisons

Dependent Variable: EFF

Tukey HSD

(I) Edu	(J) Edu	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Bachelor of Arts/Bachelor of Science (oder gleichwertig)	Master of Arts/Master of Science, Diplom (oder gleichwertig)	,0512	,30538	,985	-,6878	,7903
	PhD/Dr.	,2061	,58592	,934	-1,2119	1,6241
Master of Arts/Master of Science, Diplom (oder gleichwertig)	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	-,0512	,30538	,985	-,7903	,6878
	PhD/Dr.	,1548	,58840	,963	-1,2692	1,5789
PhD/Dr.	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	-,2061	,58592	,934	-1,6241	1,2119
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	-,1548	,58840	,963	-1,5789	1,2692

Based on observed means.
The error term is Mean Square(Error) = 1,491.

Multiple Comparisons

Dependent Variable: CAUS

Tukey HSD

(I) Edu	(J) Edu	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Bachelor of Arts/Bachelor of Science (oder gleichwertig)	Master of Arts/Master of Science, Diplom (oder gleichwertig)	,6287*	,23095	,024	,0698	1,1877
	PhD/Dr.	,2145	,44311	,879	-,8578	1,2869
Master of Arts/Master of Science, Diplom (oder gleichwertig)	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	-,6287*	,23095	,024	-1,1877	-,0698
	PhD/Dr.	-,4142	,44499	,624	-1,4911	,6627
PhD/Dr.	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	-,2145	,44311	,879	-1,2869	,8578
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	,4142	,44499	,624	-,6627	1,4911

Based on observed means.
The error term is Mean Square(Error) = ,853.

*. The mean difference is significant at the 0,05 level.

10.6 Test of Normality

Descriptives

	Edu			Statistic	Std. Error
CAUS	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	Mean		4,8545	,14096
		95% Confidence Interval for Mean	Lower Bound	4,5674	
			Upper Bound	5,1417	
		5% Trimmed Mean		4,8694	
		Median		5,0000	
		Variance		,656	
		Std. Deviation		,80974	
		Minimum		3,20	
		Maximum		6,40	
		Range		3,20	
		Interquartile Range		1,00	
		Skewness		-,461	,409
		Kurtosis		-,167	,798
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	Mean		4,2258	,18590
		95% Confidence Interval for Mean	Lower Bound	3,8462	
			Upper Bound	4,6055	
		5% Trimmed Mean		4,2606	
		Median		4,2000	
		Variance		1,071	
		Std. Deviation		1,03504	
		Minimum		1,40	
		Maximum		6,00	
		Range		4,60	
		Interquartile Range		1,60	
		Skewness		-,414	,421
		Kurtosis		,402	,821
	PhD/Dr.	Mean		4,6400	,74673
		95% Confidence Interval for Mean	Lower Bound	2,5668	
			Upper Bound	6,7132	
		5% Trimmed Mean		4,7222	
		Median		5,2000	
		Variance		2,788	
		Std. Deviation		1,66973	
		Minimum		1,80	
		Maximum		6,00	
		Range		4,20	
		Interquartile Range		2,60	
		Skewness		-1,730	,913
		Kurtosis		3,164	2,000
EFF	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	Mean		3,6061	,23508
		95% Confidence Interval for Mean	Lower Bound	3,1272	
			Upper Bound	4,0849	
		5% Trimmed Mean		3,5956	
		Median		3,6000	
		Variance		1,824	
		Std. Deviation		1,35045	
		Minimum		1,20	
		Maximum		6,20	
		Range		5,00	
		Interquartile Range		2,10	
		Skewness		,124	,409
		Kurtosis		-,681	,798
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	Mean		3,5548	,21042
		95% Confidence Interval for Mean	Lower Bound	3,1251	
			Upper Bound	3,9846	
		5% Trimmed Mean		3,5602	
		Median		3,6000	
		Variance		1,373	
		Std. Deviation		1,17156	
		Minimum		1,20	
		Maximum		5,60	
		Range		4,40	
		Interquartile Range		1,80	
		Skewness		-,007	,421
		Kurtosis		-,613	,821
	PhD/Dr.	Mean		3,4000	,99398
		95% Confidence Interval for Mean	Lower Bound	,6403	
			Upper Bound	6,1597	
		5% Trimmed Mean		3,3889	
		Median		2,2000	
		Variance		4,940	
		Std. Deviation		2,22261	
		Minimum		1,20	
		Maximum		5,80	
		Range		4,60	
		Interquartile Range		4,20	
		Skewness		,475	,913
		Kurtosis		-3,098	2,000

Case Processing Summary

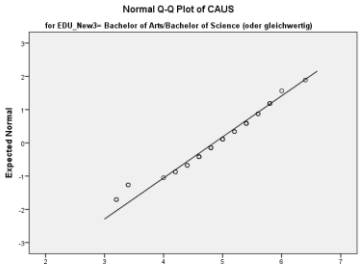
		Cases					
		Valid		Missing		Total	
	Edu	N	Percent	N	Percent	N	Percent
CAUS	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	33	100,0%	0	0,0%	33	100,0%
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	31	100,0%	0	0,0%	31	100,0%
	PhD/Dr.	5	100,0%	0	0,0%	5	100,0%
EFF	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	33	100,0%	0	0,0%	33	100,0%
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	31	100,0%	0	0,0%	31	100,0%
	PhD/Dr.	5	100,0%	0	0,0%	5	100,0%

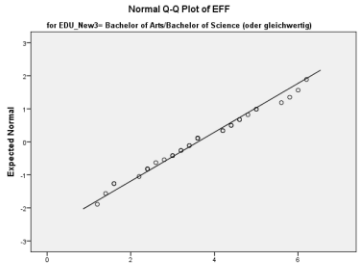
Tests of Normality

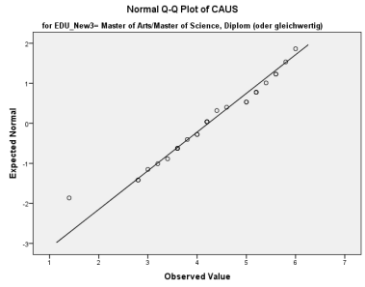
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Edu	Statistic	df	Sig.	Statistic	df	Sig.
CAUS	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	,104	33	,200*	,961	33	,273
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	,123	31	,200*	,965	31	,402
	PhD/Dr.	,290	5	,195	,825	5	,127
EFF	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	,108	33	,200*	,975	33	,642
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	,064	31	,200*	,976	31	,697
	PhD/Dr.	,305	5	,144	,799	5	,080

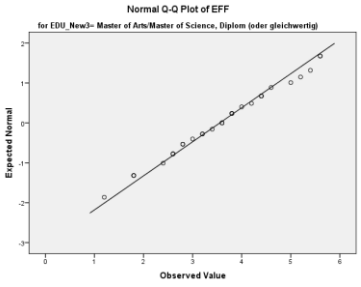
*. This is a lower bound of the true significance.

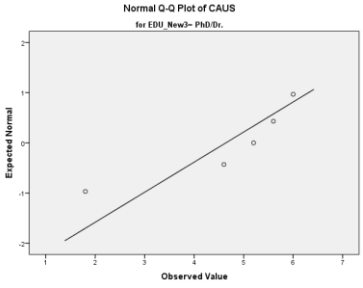
a. Lilliefors Significance Correction

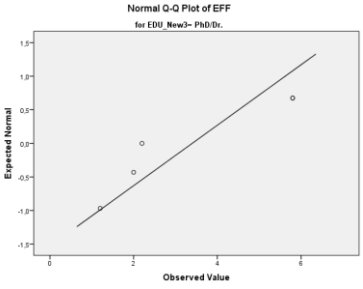






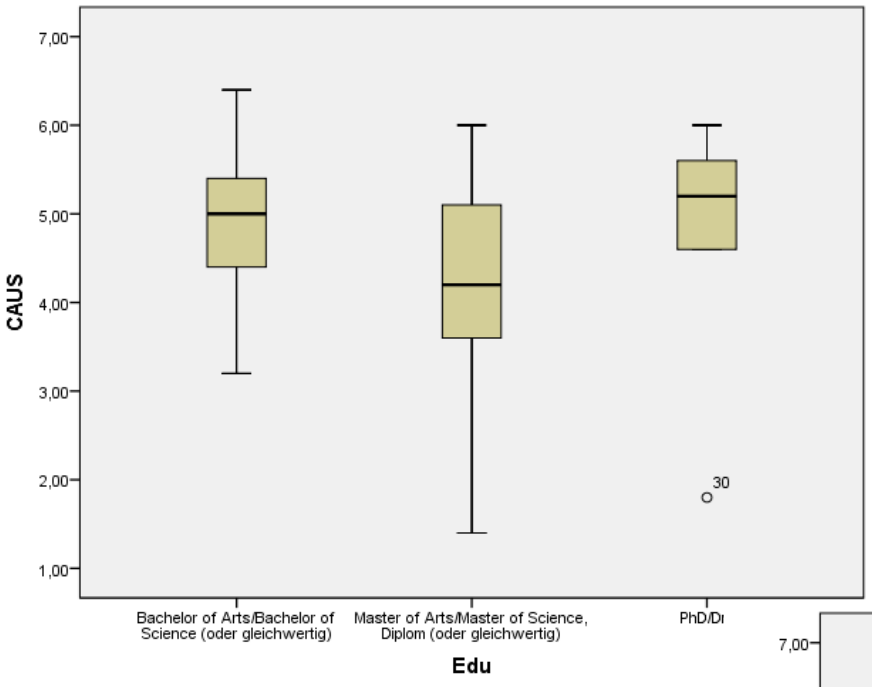




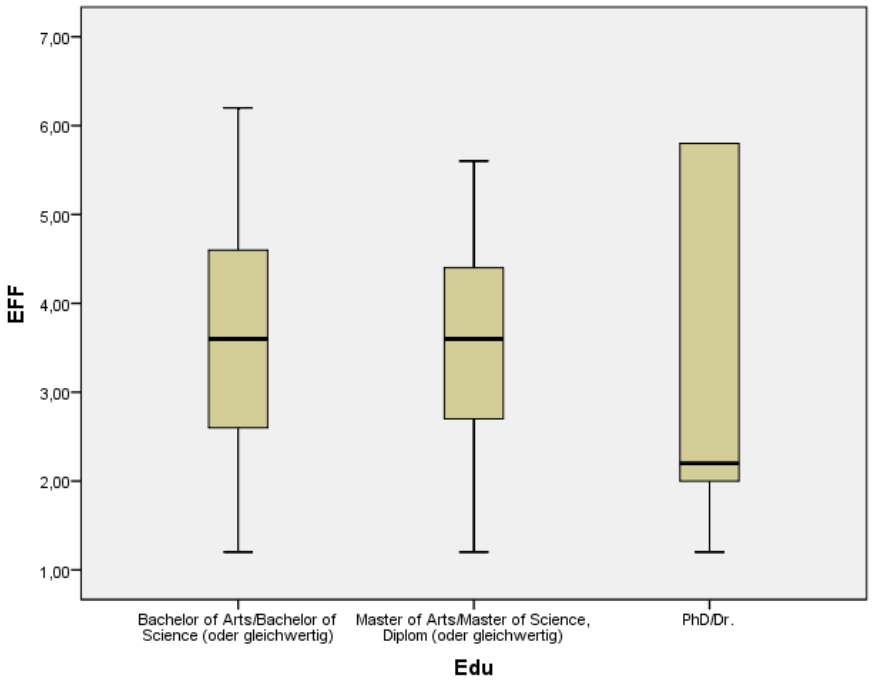


10.6.1 Boxplots

10.6.1.1 Causation Education



10.6.1.2 Effectuation Education



10.7 Paired t-test Effectuation-Education / Causation-Education

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	CAUS	4,5565	69	1,01915	,12269
	Edu	1,67	69	,816	,098
Pair 2	EFF	3,5681	69	1,32560	,15958
	Edu	1,67	69	,816	,098

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	CAUS & Edu	69	-,159	,192
Pair 2	EFF & Edu	69	-,040	,745

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	CAUS - Edu	2,88986	1,40358	,16897	2,55268	3,22703	17,103	68	,000
Pair 2	EFF - Edu	1,90145	1,58434	,19073	1,52085	2,28205	9,969	68	,000

10.8 Paired t-test

10.8.1 Effectuation-Causation

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	CAUS	4,5565	69	1,01915	,12269
	EFF	3,5681	69	1,32560	,15958

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	CAUS & EFF	69	-,344	,004

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	CAUS - EFF	,98841	1,92991	,23233	,52479	1,45202	4,254	68	,000

10.8.2 Means vs. Goals

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Caus_1	5,130	69	1,3923	,1676
	Eff_1	3,478	69	1,8599	,2239

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Caus_1 & Eff_1	69	-,269	,026

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Caus_1 - Eff_1	1,6522	2,6056	,3137	1,0262	2,2781	5,267	68	,000

10.8.3 Expected Returns vs. Affordable Loss

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Caus_2	4,884	69	1,4505	,1746
	Eff_2_affloss	4,101	69	1,6903	,2035

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Caus_2 & Eff_2_affloss	69	-,265	,028

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Caus_2 - Eff_2_affloss	,7826	2,5022	,3012	,1815	1,3837	2,598	68	,011

10.8.4 Exploit Knowledge vs. Contingencies

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Caus_3	3,348	69	1,3914	,1675
	Eff_3	3,435	69	1,8746	,2257

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Caus_3 & Eff_3	69	,020	,870

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Caus_3 - Eff_3	-,0870	2,3120	,2783	-,6424	,4684	-,312	68	,756

10.8.5 Competitive Analysis vs. Strategic Alliances

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Caus_4	4,739	69	1,4618	,1760
	Eff_4	3,739	69	1,6947	,2040

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Caus_4 & Eff_4	69	-,117	,339

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Caus_4 - Eff_4	1,0000	2,3639	,2846	,4321	1,5679	3,514	68	,001

10.8.6 Predictive vs. non-predictive control

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Caus_5	4,681	69	1,5482	,1864
	Eff_5	3,087	69	1,6868	,2031

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Caus_5 & Eff_5	69	-,395	,001

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Caus_5 - Eff_5	1,5942	2,7025	,3253	,9450	2,2434	4,900	68	,000

10.9 Correlation Matrix Effectuation Causation

Correlations

		Caus_1	Caus_2	Caus_3	Caus_4	Caus_5	Eff_1	Eff_2_affloss	Eff_3	Eff_4	Eff_5
Caus_1	Pearson Correlation	1	,328**	,401**	,458**	,279*	-,269*	-,162	-,264*	-,291*	-,318**
	Sig. (2-tailed)		,006	,001	,000	,020	,026	,184	,028	,015	,008
	N	69	69	69	69	69	69	69	69	69	69
Caus_2	Pearson Correlation	,328**	1	,181	,409**	,481**	-,186	-,265*	-,095	-,156	-,248*
	Sig. (2-tailed)	,006		,138	,000	,000	,125	,028	,439	,200	,040
	N	69	69	69	69	69	69	69	69	69	69
Caus_3	Pearson Correlation	,401**	,181	1	,356**	,202	-,037	,016	,020	,039	-,120
	Sig. (2-tailed)	,001	,138		,003	,095	,764	,896	,870	,750	,328
	N	69	69	69	69	69	69	69	69	69	69
Caus_4	Pearson Correlation	,458**	,409**	,356**	1	,567**	-,170	-,150	-,237*	-,117	-,301*
	Sig. (2-tailed)	,000	,000	,003		,000	,163	,219	,050	,339	,012
	N	69	69	69	69	69	69	69	69	69	69
Caus_5	Pearson Correlation	,279*	,481**	,202	,567**	1	-,237*	-,184	-,276*	-,116	-,395**
	Sig. (2-tailed)	,020	,000	,095	,000		,050	,130	,022	,342	,001
	N	69	69	69	69	69	69	69	69	69	69
Eff_1	Pearson Correlation	-,269*	-,186	-,037	-,170	-,237*	1	,574**	,391**	,227	,404**
	Sig. (2-tailed)	,026	,125	,764	,163	,050		,000	,001	,061	,001
	N	69	69	69	69	69	69	69	69	69	69
Eff_2_affloss	Pearson Correlation	-,162	-,265*	,016	-,150	-,184	,574**	1	,496**	,358**	,487**
	Sig. (2-tailed)	,184	,028	,896	,219	,130	,000		,000	,002	,000
	N	69	69	69	69	69	69	69	69	69	69
Eff_3	Pearson Correlation	-,264*	-,095	,020	-,237*	-,276*	,391**	,496**	1	,476**	,616**
	Sig. (2-tailed)	,028	,439	,870	,050	,022	,001	,000		,000	,000
	N	69	69	69	69	69	69	69	69	69	69
Eff_4	Pearson Correlation	-,291*	-,156	,039	-,117	-,116	,227	,358**	,476**	1	,558**
	Sig. (2-tailed)	,015	,200	,750	,339	,342	,061	,002	,000		,000
	N	69	69	69	69	69	69	69	69	69	69
Eff_5	Pearson Correlation	-,318**	-,248*	-,120	-,301*	-,395**	,404**	,487**	,616**	,558**	1
	Sig. (2-tailed)	,008	,040	,328	,012	,001	,001	,000	,000	,000	
	N	69	69	69	69	69	69	69	69	69	69

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

10.9.1 Correlation Effectuation Causation Education (L)

Correlations

		CAUS	EFF	Edu
CAUS	Pearson Correlation	1	-,344**	-,159
	Sig. (2-tailed)		,004	,192
	N	69	69	69
EFF	Pearson Correlation	-,344**	1	-,040
	Sig. (2-tailed)	,004		,745
	N	69	69	69
Edu	Pearson Correlation	-,159	-,040	1
	Sig. (2-tailed)	,192	,745	
	N	69	69	69

**. Correlation is significant at the 0.01 level (2-tailed).

10.9.2 Correlation Effectuation Causation Business Study (R)

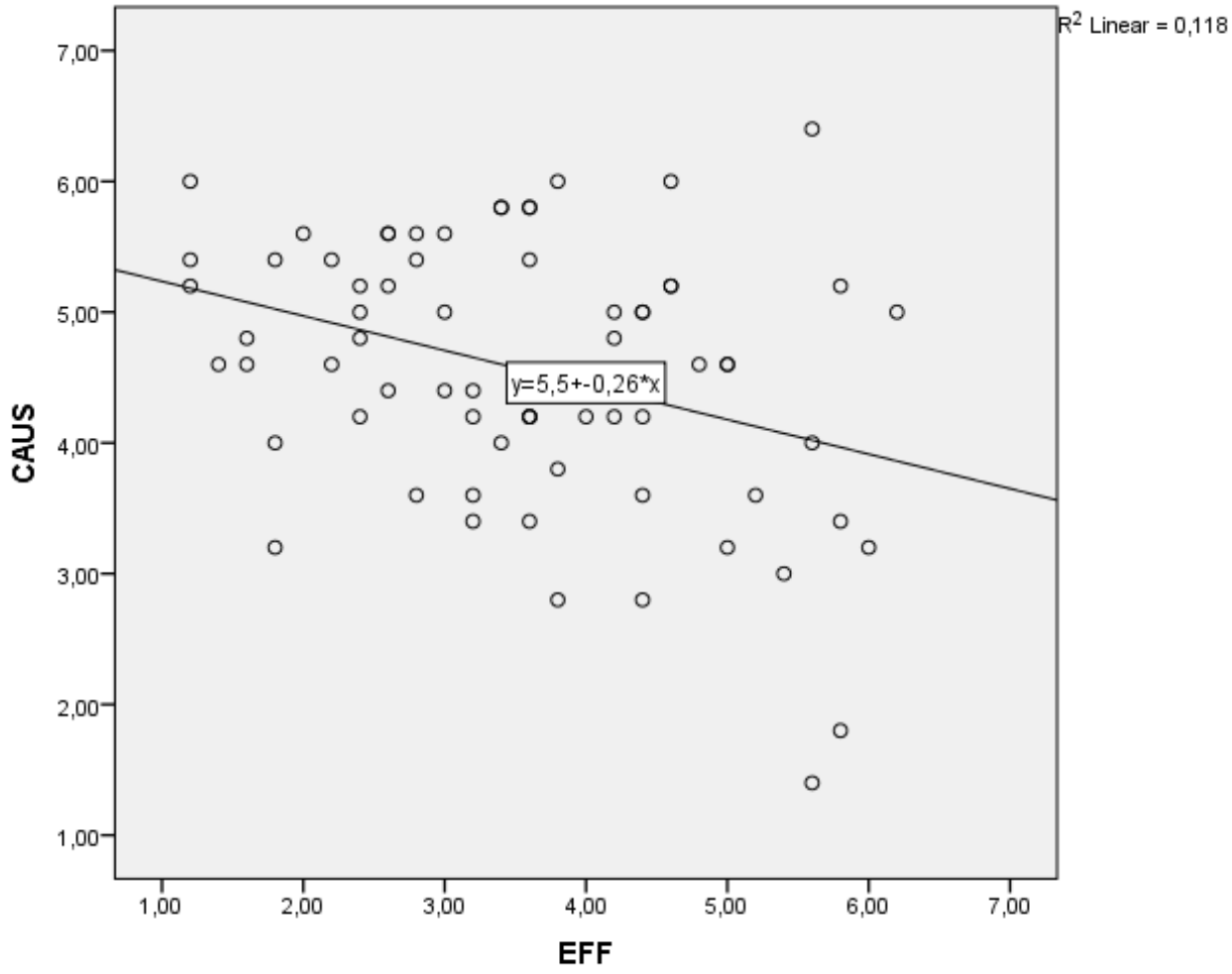
Correlations

		CAUS	EFF	Bus_Adm
CAUS	Pearson Correlation	1	-,344**	-,242*
	Sig. (2-tailed)		,004	,045
	N	69	69	69
EFF	Pearson Correlation	-,344**	1	,082
	Sig. (2-tailed)	,004		,501
	N	69	69	69
Bus_Adm	Pearson Correlation	-,242*	,082	1
	Sig. (2-tailed)	,045	,501	
	N	69	69	69

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

10.9.3 Scatterplot effectuation causation



10.10 Hypothesis 1

Descriptives

CAUS

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Bachelor of Arts/Bachelor of Science (oder gleichwertig)	33	4,8545	,80974	,14096	4,5674	5,1417	3,20	6,40
Master of Arts/Master of Science, Diplom (oder gleichwertig)	31	4,2258	1,03504	,18590	3,8462	4,6055	1,40	6,00
PhD/Dr.	5	4,6400	1,66973	,74673	2,5668	6,7132	1,80	6,00
Total	69	4,5565	1,01915	,12269	4,3117	4,8013	1,40	6,40

Test of Homogeneity of Variances

CAUS

Levene Statistic	df1	df2	Sig.
1,727	2	66	,186

ANOVA

CAUS

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6,356	2	3,178	3,264	,045
Within Groups	64,273	66	,974		
Total	70,630	68			

Multiple Comparisons

Dependent Variable: CAUS

Bonferroni

(I) Edu	(J) Edu	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Bachelor of Arts/Bachelor of Science (oder gleichwertig)	Master of Arts/Master of Science, Diplom (oder gleichwertig)	,62874*	,24683	,040	,0224	1,2351
	PhD/Dr.	,21455	,47358	1,000	-,9488	1,3779
Master of Arts/Master of Science, Diplom (oder gleichwertig)	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	-,62874*	,24683	,040	-1,2351	-,0224
	PhD/Dr.	-,41419	,47559	1,000	-1,5825	,7541
PhD/Dr.	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	-,21455	,47358	1,000	-1,3779	,9488
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	,41419	,47559	1,000	-,7541	1,5825

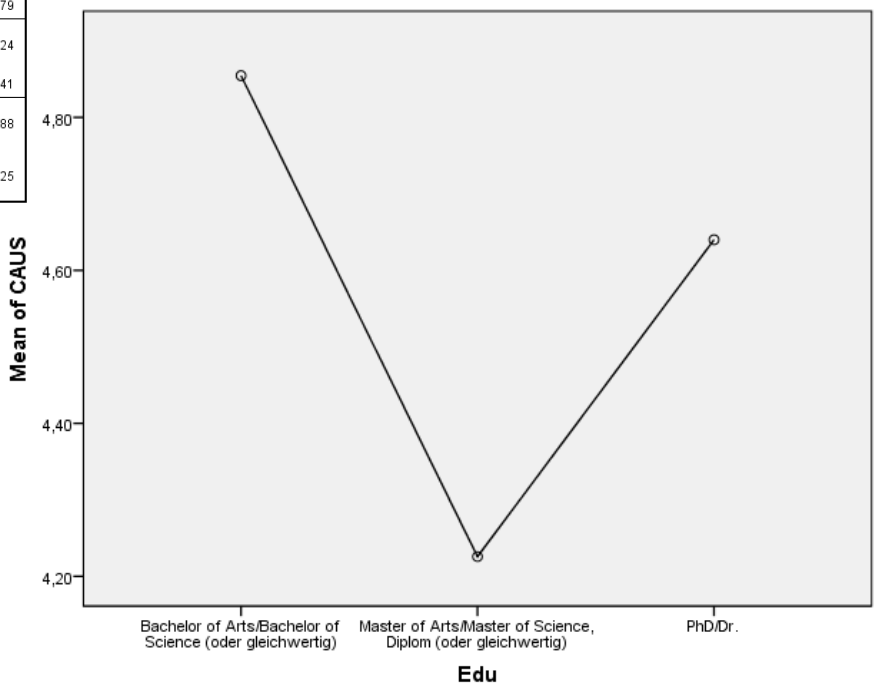
*. The mean difference is significant at the 0.05 level.

Tests of Normality

	Edu	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
CAUS	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	,104	33	,200*	,961	33	,273
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	,123	31	,200*	,965	31	,402
	PhD/Dr.	,290	5	,195	,825	5	,127

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction



10.10.1 Hypothesis 1 Putting Education into 2 Variables Low (BA, 1) High (MA, PhD, 2)

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
CAUS	Equal variances assumed	2,958	,090	2,406	67	,019	,57121	,23740	,09737	1,04506
	Equal variances not assumed			2,440	63,620	,017	,57121	,23412	,10344	1,03898

Between-Subjects Factors

		N
Edu_2	1,00	33
	2,00	36

Descriptive Statistics

Dependent Variable: CAUS

Edu_2	Mean	Std. Deviation	N
1,00	4,8545	,80974	33
2,00	4,2833	1,12161	36
Total	4,5565	1,01915	69

Levene's Test of Equality of Error Variances[a]

Dependent Variable: CAUS

F	df1	df2	Sig.
2,958	1	67	,090

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Edu_2

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Edu_2	Statistic	df	Sig.	Statistic	df	Sig.
CAUS	1,00	,104	33	,200*	,961	33	,273
	2,00	,100	36	,200*	,959	36	,200

*. This is a lower bound of the true significance.

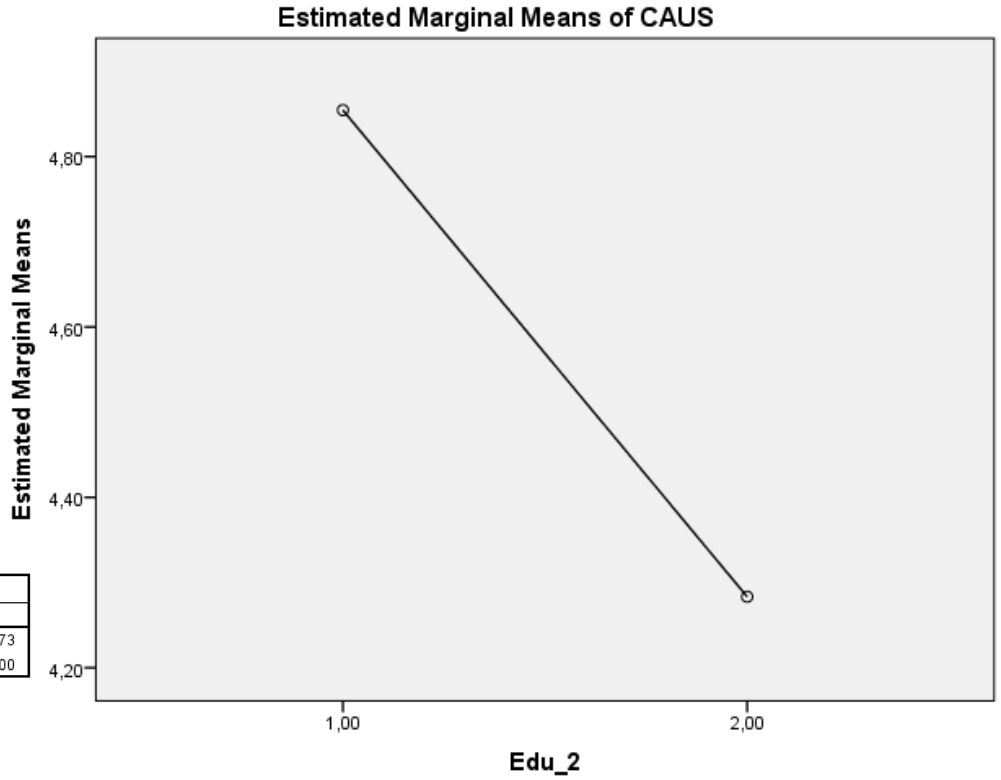
a. Lilliefors Significance Correction

Tests of Between-Subjects Effects

Dependent Variable: CAUS

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5,618[a]	1	5,618	5,790	,019
Intercept	1437,666	1	1437,666	1481,633	,000
Edu_2	5,618	1	5,618	5,790	,019
Error	65,012	67	,970		
Total	1503,200	69			
Corrected Total	70,630	68			

a. R Squared = ,080 (Adjusted R Squared = ,066)



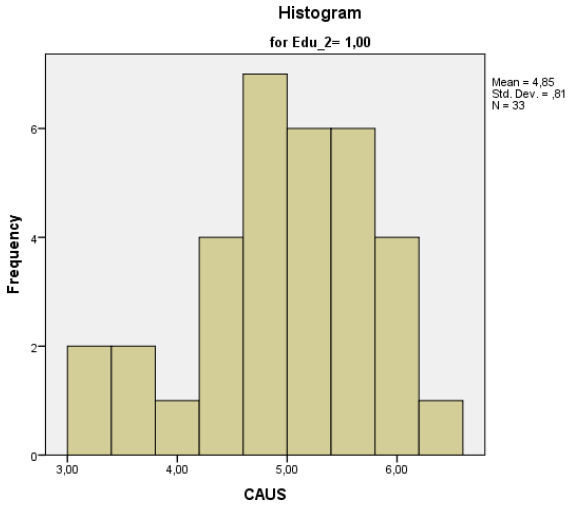
10.10.2 Test of Normality Putting Education into 2 Variables Low (BA, 1) High (MA, PhD, 2)

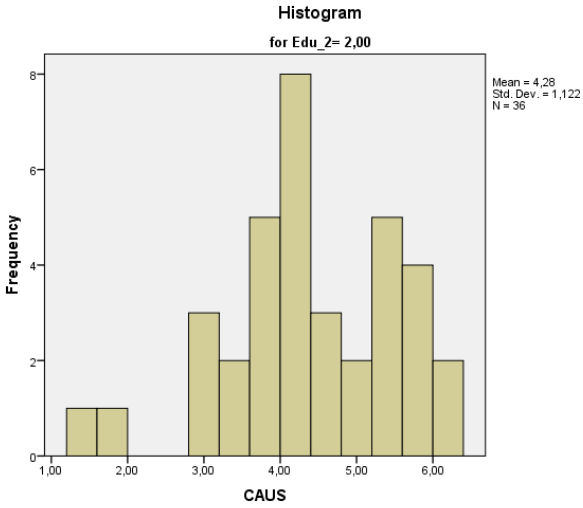
Case Processing Summary

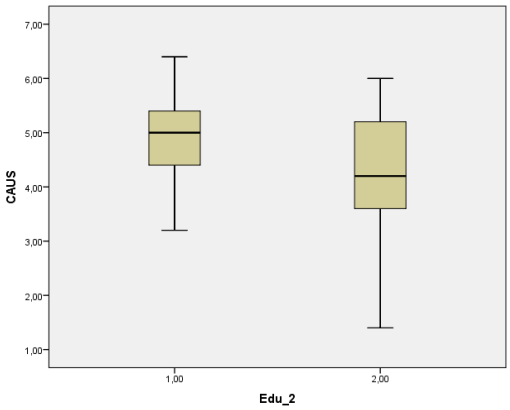
		Cases					
		Valid		Missing		Total	
	Edu_2	N	Percent	N	Percent	N	Percent
CAUS	1,00	33	100,0%	0	0,0%	33	100,0%
	2,00	36	100,0%	0	0,0%	36	100,0%

Descriptives

Edu_2				Statistic	Std. Error
CAUS	1,00	Mean		4,8545	,14096
		95% Confidence Interval for Mean	Lower Bound	4,5674	
			Upper Bound	5,1417	
		5% Trimmed Mean		4,8694	
		Median		5,0000	
		Variance		,656	
		Std. Deviation		,80974	
		Minimum		3,20	
		Maximum		6,40	
		Range		3,20	
		Interquartile Range		1,00	
		Skewness		-,461	,409
		Kurtosis		-,167	,798
	2,00	Mean		4,2833	,18693
		95% Confidence Interval for Mean	Lower Bound	3,9038	
			Upper Bound	4,6628	
		5% Trimmed Mean		4,3383	
		Median		4,2000	
		Variance		1,258	
		Std. Deviation		1,12161	
		Minimum		1,40	
		Maximum		6,00	
		Range		4,60	
		Interquartile Range		1,60	
		Skewness		-,549	,393
		Kurtosis		,134	,768







10.11 Hypothesis 2

Descriptives

EFF

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Bachelor of Arts/Bachelor of Science (oder gleichwertig)	33	3,6061	1,35045	,23508	3,1272	4,0849	1,20	6,20
Master of Arts/Master of Science, Diplom (oder gleichwertig)	31	3,5548	1,17156	,21042	3,1251	3,9846	1,20	5,60
PhD/Dr.	5	3,4000	2,22261	,99398	,6403	6,1597	1,20	5,80
Total	69	3,5681	1,32560	,15958	3,2497	3,8866	1,20	6,20

Test of Homogeneity of Variances

EFF

Levene Statistic	df1	df2	Sig.
3,952	2	66	,024

ANOVA

EFF

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,194	2	,097	,054	,948
Within Groups	119,296	66	1,808		
Total	119,490	68			

Multiple Comparisons

Dependent Variable: EFF

Bonferroni

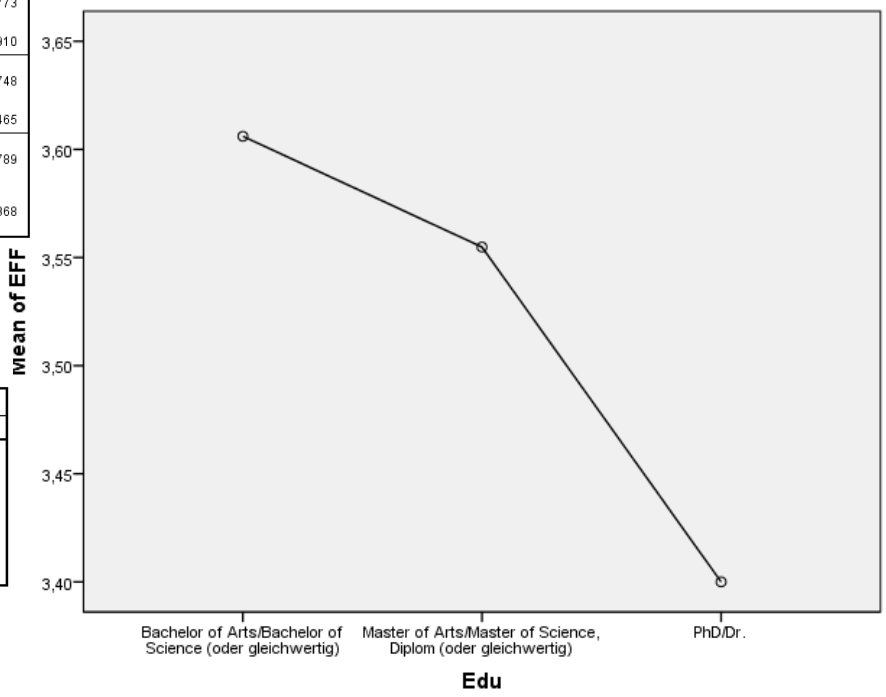
(I) Edu	(J) Edu	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Bachelor of Arts/Bachelor of Science (oder gleichwertig)	Master of Arts/Master of Science, Diplom (oder gleichwertig)	,05122	,33627	1,000	-,7748	,8773
	PhD/Dr.	,20606	,64519	1,000	-1,3789	1,7910
Master of Arts/Master of Science, Diplom (oder gleichwertig)	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	-,05122	,33627	1,000	-,8773	,7748
	PhD/Dr.	,15484	,64793	1,000	-1,4368	1,7465
PhD/Dr.	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	-,20606	,64519	1,000	-1,7910	1,3789
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	-,15484	,64793	1,000	-1,7465	1,4368

Tests of Normality

	Edu	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
EFF	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	,108	33	,200*	,975	33	,642
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	,064	31	,200*	,976	31	,697
	PhD/Dr.	,305	5	,144	,799	5	,080

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction



10.11.1 Hypothesis 2 Putting Education into 2 Variables Low (BA, 1) High (MA, PhD, 2)

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
EFF	Equal variances assumed	,001	,980	,226	67	,822	,07273	,32172	-,56943	,71488
	Equal variances not assumed			,226	66,190	,822	,07273	,32204	-,57021	,71566

Levene's Test of Equality of Error Variances[a]

Dependent Variable: EFF

F	df1	df2	Sig.
,001	1	67	,980

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Edu_2

Tests of Between-Subjects Effects

Dependent Variable: EFF

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	,091[a]	1	,091	,051	,822
Intercept	877,587	1	877,587	492,453	,000
Edu_2	,091	1	,091	,051	,822
Error	119,399	67	1,782		
Total	997,960	69			
Corrected Total	119,490	68			

a. R Squared = ,001 (Adjusted R Squared = -,014)

Between-Subjects Factors

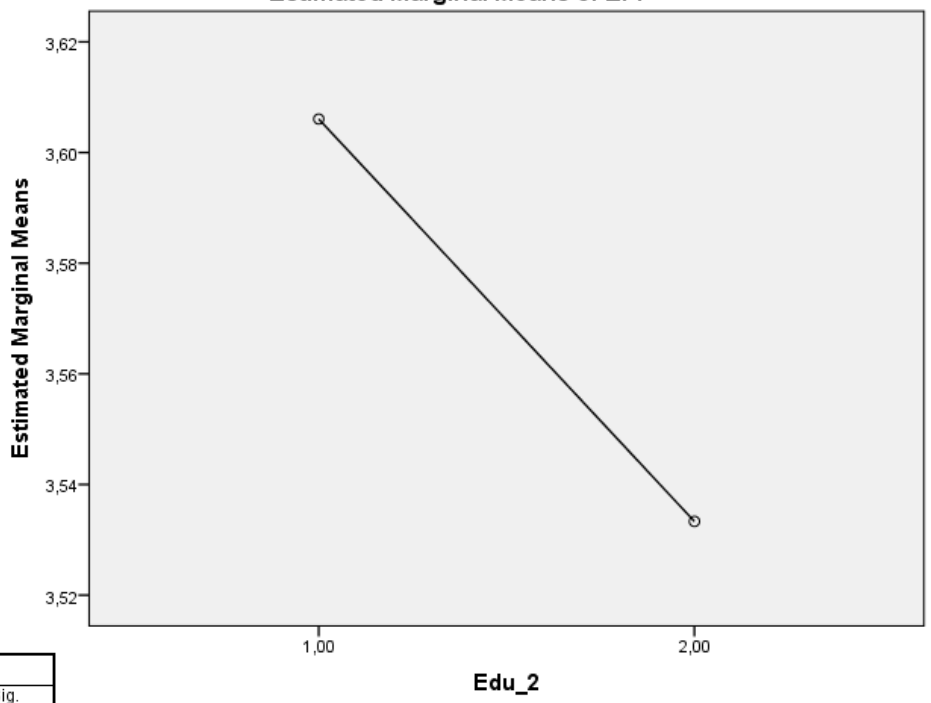
		N
Edu_2	1,00	33
	2,00	36

Descriptive Statistics

Dependent Variable: EFF

Edu_2	Mean	Std. Deviation	N
1,00	3,6061	1,35045	33
2,00	3,5333	1,32061	36
Total	3,5681	1,32560	69

Estimated Marginal Means of EFF



Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Edu_2	Statistic	df	Sig.	Statistic	df	Sig.
EFF	1,00	,108	33	,200*	,975	33	,642
	2,00	,072	36	,200*	,966	36	,333

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

10.12 Hypothesis 3

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
CAUS	Equal variances assumed	,059	,809	2,040	67	,045	,50891	,24952	,01087	1,00695
	Equal variances not assumed			2,003	47,381	,051	,50891	,25402	-,00201	1,01983

	Bus_Adm	N	Mean	Std. Deviation	Std. Error Mean
CAUS	Ja	44	4,7409	,97273	,14664
	Nein	25	4,2320	1,03711	,20742

Tests of Normality

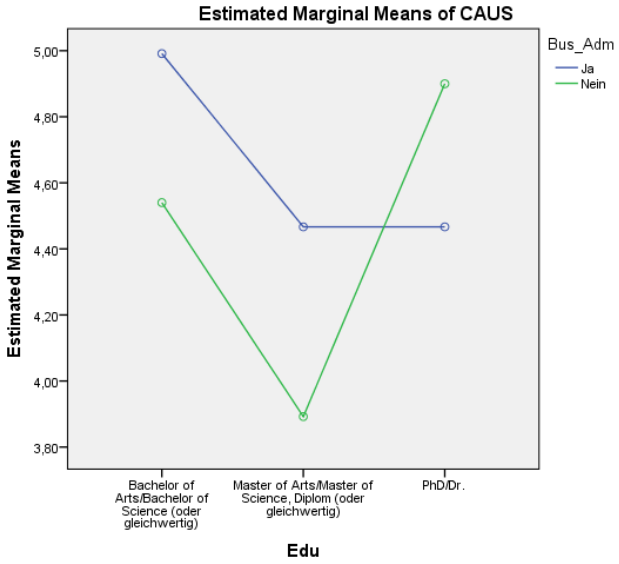
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Bus_Adm	Statistic	df	Sig.	Statistic	df	Sig.
CAUS	Ja	,105	44	,200*	,958	44	,110
	Nein	,105	25	,200*	,953	25	,287

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Between-Subjects Factors

		Value Label	N
Bus_Adm	1	Ja	44
	2	Nein	25
Edu	1	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	33
	2	Master of Arts/Master of Science, Diplom (oder gleichwertig)	31
	4	PhD/Dr.	5



Tests of Between-Subjects Effects

Dependent Variable: CAUS

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	10,491[a]	5	2,098	2,198	,065
Intercept	669,745	1	669,745	701,616	,000
Bus_admi_study	,316	1	,316	,331	,567
EDU_New3	5,200	2	2,600	2,724	,073
Bus_admi_study * EDU_New3	1,052	2	,526	,551	,579
Error	60,138	63	,955		
Total	1503,200	69			
Corrected Total	70,630	68			

Descriptive Statistics

Dependent Variable: CAUS

Bus_Adm	Edu	Mean	Std. Deviation	N
Ja	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	4,9913	,77102	23
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	4,4667	,90228	18
	PhD/Dr.	4,4667	2,31805	3
	Total	4,7409	,97273	44
Nein	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	4,5400	,84879	10
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	3,8923	1,14780	13
	PhD/Dr.	4,9000	,42426	2
	Total	4,2320	1,03711	25
Total	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	4,8545	,80974	33
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	4,2258	1,03504	31
	PhD/Dr.	4,6400	1,66973	5
	Total	4,5565	1,01915	69

10.13 Hypothesis 4

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
EFF	Equal variances assumed	,180	,673	-,677	67	,501	-,22564	,33333	-,89097	,43970
	Equal variances not assumed			-,660	46,420	,512	-,22564	,34165	-,91318	,46191

Group Statistics

	Bus_Adm	N	Mean	Std. Deviation	Std. Error Mean
EFF	Ja	44	3,4864	1,28707	,19403
	Nein	25	3,7120	1,40603	,28121

Between-Subjects Factors

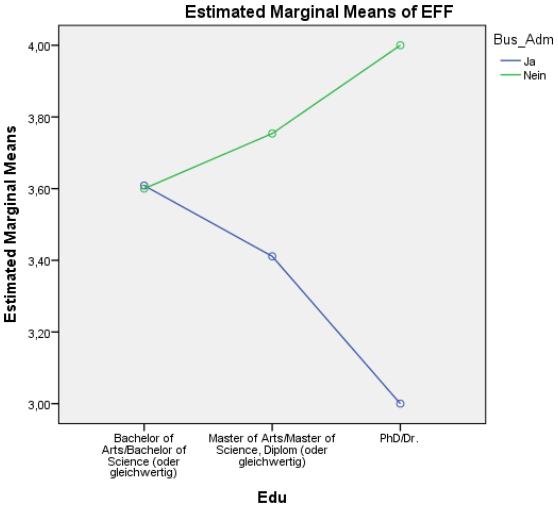
		Value Label	N
Bus_Adm	1	Ja	44
	2	Nein	25
Edu	1	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	33
	2	Master of Arts/Master of Science, Diplom (oder gleichwertig)	31
	4	PhD/Dr.	5

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Bus_Adm	Statistic	df	Sig.	Statistic	df	Sig.
EFF	Ja	,079	44	,200*	,975	44	,455
	Nein	,132	25	,200*	,965	25	,521

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction



Tests of Between-Subjects Effects

Dependent Variable: EFF

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2,282[a]	5	,456	,245	,941
Intercept	411,825	1	411,825	221,358	,000
Bus_admi_study	1,604	1	1,604	,862	,357
EDU_New3	,045	2	,023	,012	,988
Bus_admi_study * EDU_New3	1,204	2	,602	,324	,725
Error	117,208	63	1,860		
Total	997,960	69			
Corrected Total	119,490	68			

a. R Squared = ,019 (Adjusted R Squared = -,059)

Descriptive Statistics

Dependent Variable: EFF

Bus_Adm	Edu	Mean	Std. Deviation	N
Ja	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	3,6087	1,34904	23
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	3,4111	1,02778	18
	PhD/Dr.	3,0000	2,45764	3
	Total	3,4864	1,28707	44
Nein	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	3,6000	1,42673	10
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	3,7538	1,36419	13
	PhD/Dr.	4,0000	2,54558	2
	Total	3,7120	1,40603	25
Total	Bachelor of Arts/Bachelor of Science (oder gleichwertig)	3,6061	1,35045	33
	Master of Arts/Master of Science, Diplom (oder gleichwertig)	3,5548	1,17156	31
	PhD/Dr.	3,4000	2,22261	5
	Total	3,5681	1,32560	69

10.13.1 Hypothesis 4 – Extended – Putting Education into 2 Variables Low (BA, 1) High (MA, PhD, 2)

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
EFF	Equal variances assumed	,001	,980	,226	67	,822	,07273	,32172	-,56943	,71488
	Equal variances not assumed			,226	66,190	,822	,07273	,32204	-,57021	,71566

Between-Subjects Factors

		Value Label	N
Bus_Adm	1	Ja	44
	2	Nein	25
Edu_2	1,00		33
	2,00		36

Levene's Test of Equality of Error Variances[a]

Dependent Variable: EFF

F	df1	df2	Sig.
,099	3	65	,961

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Bus_admi_study + Edu_2 + Bus_admi_study * Edu_2

Tests of Between-Subjects Effects

Dependent Variable: EFF

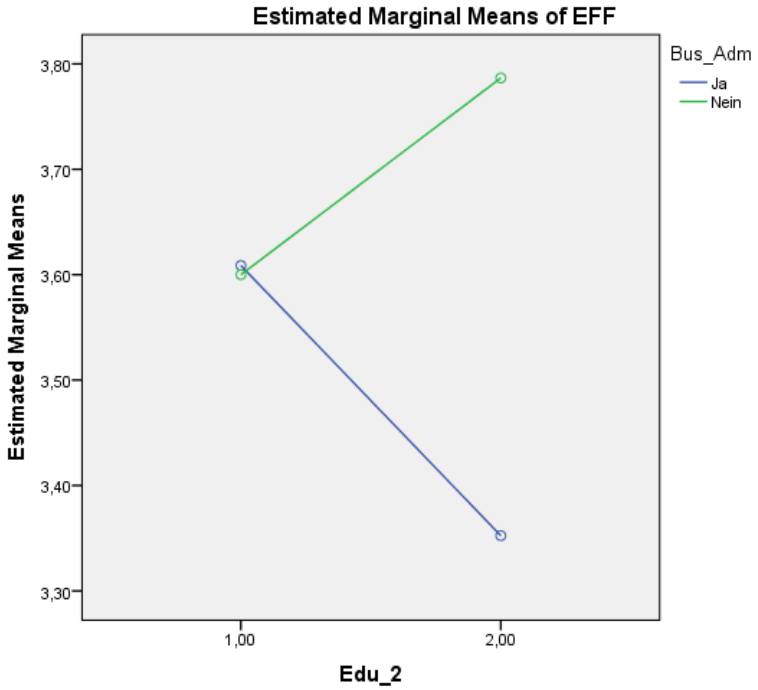
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1,742[a]	3	,581	,321	,810
Intercept	798,629	1	798,629	440,864	,000
Bus_admi_study	,703	1	,703	,388	,536
Edu_2	,019	1	,019	,010	,919
Bus_admi_study * Edu_2	,761	1	,761	,420	,519
Error	117,748	65	1,812		
Total	997,960	69			
Corrected Total	119,490	68			

a. R Squared = ,015 (Adjusted R Squared = -,031)

Descriptive Statistics

Dependent Variable: EFF

Bus_Adm	Edu_2	Mean	Std. Deviation	N
Ja	1,00	3,6087	1,34904	23
	2,00	3,3524	1,23435	21
	Total	3,4864	1,28707	44
Nein	1,00	3,6000	1,42673	10
	2,00	3,7867	1,43719	15
	Total	3,7120	1,40603	25
Total	1,00	3,6061	1,35045	33
	2,00	3,5333	1,32061	36
	Total	3,5681	1,32560	69



10.14 Hypothesis 5

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,116[a]	,014	-,001	1,3932

a. Predictors: (Constant), Edu

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1,787	1	1,787	,921	,341[b]
	Residual	130,039	67	1,941		
	Total	131,826	68			

a. Dependent Variable: Caus_1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5,461	,383		14,242	,000
	Edu	-,199	,207	-,116	-,959	,341

a. Dependent Variable: Caus_1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,010[a]	,000	-,015	1,8736

a. Predictors: (Constant), Edu

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,022	1	,022	,006	,937[b]
	Residual	235,195	67	3,510		
	Total	235,217	68			

a. Dependent Variable: Eff_1

b. Predictors: (Constant), Edu

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3,515	,516		6,816	,000
	Edu	-,022	,278	-,010	-,079	,937

a. Dependent Variable: Eff_1