The effect of entrepreneurial passion on the choice between effectual and causal decision making processes of novice entrepreneurs

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ABSTRACT

Researchers identified two streams of decision making processes in the creation of new ventures: causation and effectuation. Entrepreneurs who use causal reasoning, make use of a planned approach. With this approach, entrepreneurs undertake their business on the basis of complying to pre-determined goals and plans. On the other hand, entrepreneurs who use effectuation act on the basis of an emergent approach. With this stream, entrepreneurs focus on their available resources while being responsive to their dynamic environment. The theory of effectuation and causation is still underdeveloped, which is why researchers urged to examine the influencing factors. This thesis examines whether entrepreneurial passion - which is at the heart of entrepreneurship - plays a role in entrepreneurs' preference for effectuation or causation. Entrepreneurial passion, consisting of passion for inventing, founding and developing provides the fire that fuels innovation and persistence. This study is conducted in Malaysia amongst novice entrepreneurs, who were approached through social media and local bazaars to fill in a questionnaire. The results firstly show that novice Malaysian entrepreneurs prefer to use causation over effectuation. Entrepreneurial passion is proved to have significant relationships with effectuation/causation. All three domains of entrepreneurial passion have a significant effect on one or more of the effectuation/causation principles. Therefore, this thesis shows that entrepreneurial passion does have an effect on novice Malaysian entrepreneurs' preference for effectuation or causation.

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Keywords

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1. INTRODUCTION

"If you go back a few hundred years, what we take for granted today would seem like magic - being able to talk to people over long distances, to transmit images, flying, accessing vast amounts of data like an oracle. These are all things that would have been considered magic a few hundred years ago" – Elon Musk (founder of Tesla, SpaceX and Paypal)

In today's dynamic business environment, entrepreneurs are the lynch pin for economic growth and social change. Entrepreneurship not only enables the introduction of innovative technologies, products and services, but it also provides new job opportunities and it challenges existing firms to become more competitive and productive (Kritikos, 2014). Schumpeter (1942) already explained in the 1940's the essential societal and economical role of entrepreneurship. He argued that entrepreneurs are the core contributors to creative destruction, meaning that something new (i.e. product or process innovation) leads to the demise of what existed before. The adoption of innovations that in the past were deemed improbable - such as flying and digitisation – can bring benefits to the society which could not have been imagined. Entrepreneurs are thus extremely important in setting today's environment. Consequently, the importance of entrepreneurship has faced increasing attention from researchers.

Researchers have widely accepted that entrepreneurship is a process by which individuals – irrespective of the organisational context – recognise opportunities and create (sub)organisations to pursue them (Stevenson & Jarillo, 1990). In order to recognise opportunities and create new ventures, entrepreneurs constantly have to make a wide variety of decisions. The decision making processes which entrepreneurs employ are hence quintessential for setting the direction of their business and for the execution of plans. Decisions that are made can after all affect a business both positively and negatively. Therefore, researchers have identified and discussed two main streams of entrepreneurial decision making processes.

Decision making processes were historically considered from planned behaviour approaches wherein entrepreneurs set pre-determined goals and targets in order to build, run and grow their organisation (Ansoff, 1991, 1994; Mintzberg, 1990, 1991). Scholars following this approach indicate that planning is necessary in order to be more effective and efficient. This approach was later termed 'causation' (Sarasvathy, 2001). More recent literature proposes that instead of planned behaviour, entrepreneurs can also make decisions on the basis of a more intuitive and emergent approach (Brinckmann et al., 2010; Fisher, 2012). This approach is known as 'effectuation', which was proposed by Sarasvathy (2001). Sarasvathy states that in essence entrepreneurs who use effectuation first reflect on their available means, and only then choose their preferred effects or outcomes. Scholars following effectuation argue that due to uncertain environments applying a planned approach is of no use (Sarasvathy, 2001). Effectual decision making processes make sure that new opportunities that arise are not overlooked (Delmar & Shane, 2003).

Knowing which decision making processes entrepreneurs can employ is essential, as it can help to understand which process can be used better in certain circumstances. However, the theory of effectuation is not ubiquitous and has received criticism. Fischer and Reuber (2011) discussed that in effectuation research only one variable – expertise – has been used for justifying the use of an effectual decision making process. Similarly, Baron (2009) questioned the empirical analysis in effectuation, as studies did not provide real explanations as for why entrepreneurs employ different thought and decision making processes. Arend et al. (2015) further strengthens the questionability of effectuation theory. One of the key insights that are drawn is that the boundaries of effectuation are not defined. Effectuation theory explains what entrepreneurs can do and how they can act, but it does not provide explanations as for when effectuation might be more effective and better than causation in different circumstances. In other words, it is underspecified when entrepreneurs should use effectual decision making processes. Empirical research has also mainly focused on effectuation as a dependent variable, and neglected influencing variables. Arend et al. (2015) therefore address the urge to empirically test how and when entrepreneurs tend to use effectual decision making processes. This thesis proposes that one of the influencing factors for the entrepreneur's choice to use effectuation could be entrepreneurial passion (EP), as Murnieks et al. (2014) stated that passion is associated with entrepreneurial behaviour.

Passion is at the heart of entrepreneurship. Cardon et al. (2017) argue that entrepreneurial passion plays a crucial role in entrepreneurship, by providing the fire that fuels innovation and persistence. For instance, passion has been associated with the ability to raise funds from investors (Miteness et al., 2012; Sudek 2006) and with the commitment employees display towards entrepreneurial ventures (Breugst et al., 2012). Passion ultimately has a quintessential motivational effect. Considering the creation of new ventures, it helps in overcoming many difficulties that inevitably will be faced. 'Passion can make the improbable probable' (Smilor, 1997, p. 342). Despite this common understanding of its importance, the role of entrepreneurial passion (EP) in the two mainstream decision making processes has, to our best knowledge, not yet been researched. In this line, Cardon et al. (2013) emphasised the need to empirically test the effect of entrepreneurial passion on the decision making processes of entrepreneurs in new venture creation.

Cardon et al. (2013) propose that three different domains of entrepreneurial passion exist: entrepreneurs can posses passion for inventing, founding and/or developing. As entrepreneurs can have different levels of entrepreneurial passion for each domain, this may subsequently lead to entrepreneurs employing different decision making processes. This study aims to identify the levels of entrepreneurial passion of the different domains, as well as which decision making processes prevail, in order to describe to what extent entrepreneurial passion plays a role in this.

As Sarasvathy's (2001) theory of effectuation is especially applicable for expert entrepreneurs, it is emphasised that effectual decision making processes of novice entrepreneurs should also be tested empirically (Perry et al., 2012). Therefore, this study refers to novice entrepreneurs: entrepreneurs who do not have any previous entrepreneurial experience (Westhead & Wright, 1998). This leads to the following central research question:

To what extent does entrepreneurial passion influence the choice between effectual and causal decision making processes of novice entrepreneurs?

This research question enables the identification of how, if at all, entrepreneurial passion influences the decision making processes of novice entrepreneurs in terms of effectuation and causation. Besides, the research also analyses which decision making processes novice entrepreneurs tend to employ, which is essential in order to further describe the theory of effectuation.

In order to answer this research question, the levels of entrepreneurial passion of the different domains are analysed, and compared with the preference for effectual or causal decision making processes that entrepreneurs employ.

The structure of this report is as follows. First the theoretical framework is explained consisting of the domains of entrepreneurial passion, effectuation and causation. This is also the chapter where the hypotheses are laid down. Next, the methodology is described comprising the sample, research instrument, methods of analysis and variables. Hereafter the results of the study are presented, followed by the discussion, conclusion, limitations and recommendations for future research.

2. THEORETICAL FRAMEWORK

For the theoretical framework it is essential to use relevant and reliable articles. Therefore, first the impact factor of journals are assessed through Web of Science and only those journals with high impact factors are used. After having identified relevant journals, Web of Science and Scopus are used to find articles. Besides the impact factor of journals, also the amount of citations of articles are an important indicator. Hence, articles that have no or almost no citations are not taken into account in this thesis.

2.1 Decision making processes: Effectuation and Causation

The decision making processes that take place during the creation of a new venture, can be described by either an emergent or a planned approach. The emergent approach reflects effectuation, whereas the planned approach reflects causation. More specifically, Sarasvathy (2001, p.245) defined an effectual decision making process as "taking a set of means as given and focusing on selecting between possible effects that can be created with that set of means". First, the availability of means or resources are considered by an entrepreneur and the objectives will be defined on the basis of the available means. Causal decision processes are exactly the opposite: "they take a particular effect as given and focus on selecting between means to create that effect" (Sarasvathy, 2001, p. 245). Entrepreneurs clearly define the objectives they want to achieve upfront where after they start to search, evaluate and select opportunities that maximise results (Drucker, 1998).

Using an effectual or causal process is not necessarily better or worse. The effectiveness of either one approach depends on the circumstances: effectuation is said to be more effective when there is an uncertain and unpredictable environment, and causation is said to be more effective when entrepreneurs act in certain and predictable environments (Harms & Schiele, 2012). Sarasvathy (2001) also describes that effectuation and causation can be complementary: they do not necessarily pull in opposite directions. It could be that optimal decisions result from a combination of both processes, where causation ensures focus and the prediction of what is predictable, while effectuation processes allow entrepreneurs to respond appropriately to uncertain (business) environments (Reymen et al., 2015).

In order to explain the difference between effectuation and causation, Sarasvathy (2001) identified five core characteristics that distinguish the two approaches from each other. The five principles are comprised of: basis for taking actions, predisposition towards risk and resources, the attitude towards unexpected events, the attitude towards outsiders and the view of the future (Dew, Read, Sarasvathy, Wiltbank, 2009). The effectuator – an entrepreneur who uses effectual decision making processes – tends to take actions on the basis of means, considers risk on the basis of affordable loss, embraces changes in the environment, constantly connects and forms partnerships with others, and lastly aims to control and influence the unpredictable future. In figure 1 these sub-constructs are displayed together with the characteristics of effectuation and causation.

Sub-construct	Effectuation	Causation
Basis for taking actions	Means	Goals
Predisposition towards risk and resources	Affordable loss	Expected returns
Attitude towards unexpected contingencies	Exploiting contingencies	Exploiting pre-existing knowledge
Attitude towards outsiders	Strategic alliance	Competitive analysis
View of the future	Controlling the unpredictable future	Predicting the uncertain future

Figure 1 – Characteristics effectuation and causation

2.1.1 Basis for taking action: Means vs goals

This first principle is often referred to as the bird in hand principle, which describes what means are available to entrepreneurs. There are three categories of means: who I am, what I know and whom I know (Sarasvathy, Kumar, York & Bhagavatula, 2014; Sarasvathy 2001, p250). 'Who I am' refers to traits, abilities and tastes of the entrepreneur. 'What I know' refers to the knowledge, expertise and experience. 'Whom I know' describes the personal network of the entrepreneur. The effectuator takes actions on the basis of these means, whereas with causation first goals are set after which the means will be acquired in order to achieve the goals. They have a growth oriented and goal based vision (Dew et al., 2009).

2.1.2 Predisposition towards risk and resources: Affordable loss vs expected returns

The affordable loss principle (Sarasvathy, 2001; Read, Dew, Sarasvathy, Song, Wiltbank, 2009) starts with the notion that an entrepreneur's perception may not be solely based on means. Instead, the risk perception of entrepreneurs also influence the decision to create a new venture (Sarasvathy, Kumar, York & Bhagavatula, 2014). For effectuators the focus would be on minimising losses as opposed to having a focus on expected returns (Read et al., 2009). This enables freedom to focus on experimenting with various strategies, which could create more options in the future (Sarasvathy, 2001). Causation in its turn would focus on maximising returns and on using optimal strategies.

2.1.3 Attitude towards unexpected contingencies: Exploiting contingencies vs exploiting pre-existing knowledge

The third principle is called the lemonade principle (Sarasvathy, 2009), which posits that entrepreneurs following an effectual process would embrace contingencies and surprises. New information can namely be used to change the strategy of the venture, enabling further development (Dew et al., 2009). When entrepreneurs embrace and leverage new and unexpected information, ineffective projects can be abandoned and new emerging possibilities can be pursued (Chandler et al., 2011). Entrepreneurs using a causal approach would try to

avoid contingencies by careful planning and risk avoiding behaviour (Sarasvathy & Dew, 2005).

2.1.4 Attitude towards outsiders: Strategic alliance vs competitive analysis

The fourth principle is the crazy quilt principle (Sarasvathy, 2009; Read, Sarasvathy, Dew & Wiltbank, 2016), which states that effectuators build strategic alliances and build partnerships through engaging with a wide variety of people who may contribute to the venture. Entrepreneurs applying causation on the other hand would apply extensive research in order to identify stakeholders based on the predetermined goals (Sarasvathy, Kumar, York & Bhagavatula, 2014).

2.1.5 View of the future: Controlling the unpredictable future vs predicting the uncertain future

The fifth and last principle is called the pilot in the plane principle (Sarasvathy, 2009). Effectual entrepreneurs focus on the controllable aspects of an unpredictable future (Sarasvathy, 2001). When effectual entrepreneurs are faced with a highly uncertain future, they will try to learn as much about it as possible, with a view on intervening with the future in order to transform and reshape it (Sarasvathy, Kumar, York & Bhagavatula, 2014). Causal entrepreneurs on the other hand would focus on the predictable aspects of the uncertain future, and would control it to the extent to which they can predict (Sarasvathy, 2001). In the latter case, the pilot has no control of what is happening.

2.2 Entrepreneurial Passion

In the literature of passion, three main streams can be found. The first is a description of passion by Vallerand et al. (2003; 2008), wherein two types of passion were identified: harmonious passion and obsessive passion. Another identified type of passion is 'passion for work' (Baum et al. 2001; Baum & Locke, 2004). However, these are broad conceptualisations of passion not specifically intended for entrepreneurial activity. The stream that this thesis focuses on is based on the description and scale that was specifically designed for entrepreneurs: entrepreneurial passion, as proposed by Cardon (2009; 2013).

Entrepreneurial passion is defined by Cardon (2009, p. 519) as "consciously accessible, intense positive feelings experienced by engagement in entrepreneurial activities associated with roles that are meaningful and salient to the self-identity of the entrepreneur". This means that entrepreneurial passion is not simply about entrepreneurs' feelings towards activities, but also about the centrality of these activities to the self-identity of the entrepreneur. Cardon et al. (2013) argue that entrepreneurial passion consists of three different domains: passion for inventing, passion for founding and passion for developing. These three domains not only focus on the intense positive feelings entrepreneurs have, but it also focuses on the identity centrality of these domains to the entrepreneur.

2.2.1 Passion for inventing

Passion for inventing includes activities related to identifying new market opportunities, developing new products and services, and working with new prototypes (Cardon et al., 2013). In order to identify market opportunities, entrepreneurs typically scan the environment to learn about consumer problems and needs. Entrepreneurs who display passion for inventing enjoy exploring opportunities, experimenting with designing possible products and services, and finding solutions for problems and needs.

2.2.2 Passion for founding

Passion for founding is related to the collection of financial, human and social resources that are needed to create a new venture (Cardon et al., 2013). Some entrepreneurs find more pleasure in the actual founding of an organisation, as opposed to merely inventing a new product or service. According to Katz and Gartner (1988), entrepreneurs might feel a need for achievement and founding an organisation is a tangible visualisation of their entrepreneurial activity. Westhead and Wright (1998) describe three types of founders. Novice founders are entrepreneurs who found a business for the first time and have no previous experience. Portfolio founders are those that keep ownership of their business, but nevertheless create a new venture in the future. Serial founders are entrepreneurs that constantly try to create new ventures in order to sell the business for a profit.

2.2.3 Passion for developing

Passion for developing is related to growing and expanding new ventures after they have been founded (Cardon et al., 2013). According to Cliff (1998), it could be that entrepreneurs do not experience passion for inventing or founding, but instead have a conscious passion to grow and expand a venture. The entrepreneur that advocates the development of the venture, is likely to engage in different management styles in order to ensure constant development for the future (Baum and Locke, 2004). Although entrepreneurs tend to show more passion for developing a venture that they founded themselves, it might also be possible that entrepreneurs develop the business of other existing ventures (Cardon et al, 2013). Typical activities that are performed by entrepreneurs that enjoy developing firms are optimising marketing efforts, finding investors to secure capital, improving the value chain and minimising costs by efficient and effective planning and control.

2.3 Hypotheses

In order to derive at appropriate hypotheses, the three domains of entrepreneurial passion are tested in combination with the principles of effectuation or causation. Therefore, one hypothesis is constructed for each EP domain respectively. One additional hypothesis is used to not simply take one effectual or causal principle into account, but also the entire construct.

Entrepreneurs who are passionate about inventing enjoy exploring opportunities, experimenting with and designing potential products and services (Cardon et al., 2013). Exploring and experimenting with opportunities are uncertain activities. Using a causal approach, entrepreneurs would focus on avoiding contingencies by careful planning and risk avoiding behaviour. However, due to the uncertainty that is involved in inventing, it would be better for entrepreneurs to use an effectual approach in which they constantly review the external environment and embrace contingencies. It is thus likely that entrepreneurs who are passionate about inventing tend to exploit contingencies. This leads to the first hypothesis:

H1: Novice entrepreneurs who posses high levels of passion for inventing tend to use the effectual approach 'exploiting contingencies', as opposed to using the causal approach 'exploiting pre-existing knowledge'.

Entrepreneurs who are passionate about founding businesses tend to focus on collecting financial, human and social resources (Cardon et al., 2013). Often these resources are not yet available to the entrepreneur, but they first have to be gathered externally. This domain of entrepreneurial passion in essence proposes that entrepreneurs should make use of a causal approach. First goals are set - i.e. for founding a new venture –

and the entrepreneur needs to collect the resources in order to meet these goals. This leads to the second hypothesis:

H2: Novice entrepreneurs who have high levels of passion for founding tend to use the causal approach 'goals orientation', as opposed to using the effectual approach 'means orientation'.

Entrepreneurs who posses high levels of passion for developing typically focus on optimising marketing activities, finding investors to secure capital and minimising cost by efficient and effective planning and control (Cardon et al., 2013). This means that entrepreneurs should not make use of an effectual approach, in which they would make decisions on the basis of potential affordable losses. Instead, they should focus on using causation, by considering profitability potentials in order to assure expected returns. Entrepreneurs who enjoy developing firms constantly try to assess the financial feasibility of projects and undertake projects on the basis of expected returns. This results in the third hypothesis:

H3: Novice entrepreneurs with high levels of passion for developing tend to use the causal approach 'expected returns', as opposed to using the effectual approach 'affordable loss'.

Next to examining whether there is a preference for effectuation and causation on the basis of the five principles, it is of interest to study whether effectuation and causation as a construct are related to one of the entrepreneurial passion domains. Especially passion for inventing appears to take on the perspective of an overall effectual approach: entrepreneurs act in an uncertain environment, and do this by using a more intuitive and emergent approach while reacting to changing opportunities and needs. Therefore the fourth and last hypothesis posits:

H4: Novice entrepreneurs who are most passionate about inventing tend to use effectual decision making processes, as opposed to novice entrepreneurs with high levels of passion for founding and developing.

The hypotheses are summarised in the following figure 2:

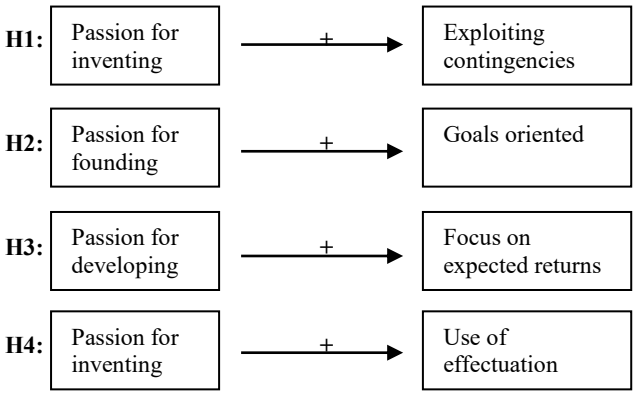

Figure 2 – Overview hypotheses

3. METHODOLOGY

This section of the thesis explains the methodology that is used in order to conduct the research. The sample, research instrument, assessment of the research instrument, and the various variables are the point of focus.

3.1 The sample

The study is conducted in Malaysia. As Perry et al. (2012) argued about the need to empirically test effectuation on novice entrepreneurs, the sample of this study will comprise of novice entrepreneurs. Malaysia is at the time of writing close to becoming a first world country ("Malaysia's Economy", 2018), and consequently entrepreneurship is a focal area. Understanding the motives of Malaysian novice entrepreneurs and their preference for the use of either effectuation or causation, is essential to further explain effectuation theory.

In order to conduct the research, Malaysian entrepreneurs were approached through various means, online as well as offline. Firstly, entrepreneurs were found via the database of Malaysian incubator MaGIC (69), via kuala-lumpur.startups-list.com (approximately 100), AngelList (approximately 500), via Yellowpages.my (approximately 200) and via specific Facebook groups for Malaysian entrepreneurs. After the names of the entrepreneurs were found, Facebook, LinkedIn and email were used to approach the entrepreneurs.

Besides approaching entrepreneurs solely through online media, they were also approached directly at bazaars. Multiple bazaars were visited in which entrepreneurs' were asked to fill in a paper copy of the survey. If the entrepreneur was not present at the booth, a name card was taken home which provided the contact details of the owner of the business. At the six markets approximately 200 booths were visited, of which approximately 60 were occupied by the entrepreneur itself. 55 of these entrepreneurs agreed to fill in the paper copy of the survey. Through the name cards acquired at the other booths, the other entrepreneurs were contacted mainly via WhatsApp to fill in the online survey.

Lastly, pop-up stores were visited in which start-ups sell their products. The products in the pop-up stores were scrutinised, as this often displayed the contact details of the owner of the start-up. Approximately 100 contact details were found this way, and the entrepreneurs were mainly approached via WhatsApp.

In total, approximately 1200 entrepreneurs were approached, and a reminder was sent after 2 weeks to the entrepreneurs who had not yet filled in the survey. This resulted in 139 entrepreneurs who filled in the survey. However, the sample size decreased due to the criteria that had to be taken into account: the entrepreneur needs to have at least a bachelor's degree, should be the owner and founder of the business, it should be the first venture that the entrepreneur has created, should not have been an entrepreneur for more than 5 years, and consequently the business should not have existed for more than 5 years. After filtering out the cases that did not meet the criteria, the sample size decreased to a total n = 81.

Of the 81 novice entrepreneurs in the sample, 32.1% (26) is male, 65.4% (53) is female, and 2.5% (2) stated 'other'. The youngest entrepreneur is 22 years old, whereas the oldest entrepreneur is 60 years old. The mean age of the entrepreneurs is 31.95 years. On average the businesses have been in existence for 2.5 years. Appendix 10.1 shows these results.

3.2 Research instrument

In order to test effectuation/causation and entrepreneurial passion, the research makes use of reliable and validated scales, respectively developed by Alsos et al. (2014) and Cardon et al. (2013).

Even though the scales are developed in English, and this study is conducted in Malaysia, the survey is not translated to Bahasa Malay. Malaysia has been colonised by the British until 1957, which nowadays is reflected in the majority of the civilians still speaking English as first language.

The aforementioned scales were combined into an online survey via Google Forms, and into a paper copy of the survey.

3.2.1 Effectuation and causation

In order to test the dependent variable effectuation and causation, the scale created by Alsos et al. (2014) is used. This

scale makes use of the five principles of effectuation and causation. It thus has 10 question, of which 5 are related to effectuation and 5 are related to causation. Each question reflects one principle from either effectuation or causation.

The 10 questions are measured via a 7-point Likert scale, where 1 = Strongly disagree and 7 = Strongly agree. Using a 7-point Likert scale ensures that the subjects have more options to choose from, leading to more accurate data.

3.2.2 Entrepreneurial Passion

In order to measure the independent variable entrepreneurial passion, a validated scale created by Cardon et al. (2013) is used. This scale focuses on the three dimensions: passion for inventing, founding and developing. For the first dimension (passion for inventing) four items, and for the other two domains (passion for founding and developing) three items respectively are asked with regards to the intense positive feelings (IPF). Also one item per domain is used to assess the identity centrality (IC) of the domain to the entrepreneur. In total the scale thus has 12 questions. The relation between the three dimensions and effectuation will be assessed separately, as an overall measure is theoretically inconsistent. Edwards (2011, p.384) explains this: "if the construct associated with formative measures is defined as nothing more than a combination of its measures, then the construct itself can be eliminated from the model, and the relationships between the measures and other variables can be examined jointly".

The 12 entrepreneurial passion questions also makes use of a 7-point Likert scale, where 1 = Strongly disagree and 7 = Strongly agree. The reason for using a 7-point Likert scale is to 'guard against issues of range restriction' (Cardon et al., 2013, p.394). The items can be found in appendix 10.14.

3.3 Data analysis

In order to analyse the gathered data, IBM SPSS Statistics 23 was used. In the results section first the statistical difference between effectuation and causation is determined via a paired t-test, and the hypotheses are tested via multiple linear regression. However, first a Cronbach's Alpha and exploratory factor analysis is conducted. The Cronbach's Alpha is measured in order to test internal consistency of the items. The exploratory factor analysis is used to assess whether the items of the scales measure the correct construct and underlying latent variable. As the scales for effectuation/causation and entrepreneurial passion have been established in the United States, it is essential to test whether the items of the scales also measure the correct construct in Malaysia.

First of all, the Cronbach's Alpha (appendix 10.2.1) is calculated. The effectuation/causation scale has 5 effectuation items ($\alpha = 0.864$) and 5 causation items ($\alpha = 0.620$). The entrepreneurial passion scale has 5 items regarding passion for inventing ($\alpha = 0.825$.), 4 items regarding passion for founding ($\alpha = 0.821$) and 4 items concerning passion for developing ($\alpha = 0.847$). Typically Cronbach Alphas should be higher than 0.70 in order to assure the internal consistency of the scales (Hair, 2013). Although the Cronbach's Alpha for the causation scale is lower than this threshold, Gabrielsson & Politis (2011) mention that lower Alphas are generally accepted when scales are based on a few items, and when the research is exploratory. Next, Alsos et al. (2014) justified that the scale is developed to have a broad measure of effectuation and causation in line with theory, which generally leads to lower Cronbach Alphas than concepts that are measured very narrowly. Therefore, the causation scale is used for further analysis.

In order to conduct the exploratory factor analysis, a Principal Component Analysis (PCA) is performed in order to reduce the number of items to factors/sub-constructs. For testing the 10 effectuation/causation items, the orthogonal rotation (varimax) is used. The reason for this is that effectuation and causation are two independent factors. First the correlation matrix is checked for correlations higher than 0.8, which could suggest multicollinearity. No correlations of this kind are measured. Next, the determinant is 0.029, which is higher than the minimum of 0.0001. The Kaiser-Meyer-Olkin (KMO) test has statistic 0.749, which is higher than the minimum of 0.5 (Kaiser, 1970). The Bartlett's test of Sphericity has p-value <0.0001, which is well below the significance level of $p<0.05$ (Bartlett, 1950). This means that all criteria for executing the factor analysis are fulfilled. The PCA (appendix 10.2.2.1) shows 2 factors with an eigenvalue higher than 1, of which the causation items load on factor 2 and the effectuation items load on factor 1. This means that the items measure the correct construct.

In order to test the whether the items of entrepreneurial passion measure what they are intended to measure, a different factor rotation is used (appendix 10.2.2.2). The domains of entrepreneurial passion could be correlated with each other, which is why the non-orthogonal oblimin rotation is used. The correlation matrix shows no correlations above 0.8, the determinant (0.001) is higher than 0.0001, the KMO test (0.757) is higher than 0.5 and Bartlett's test of Sphericity ($p<0.0001$)) has a P-value smaller than 0.05. Thus, all criteria are fulfilled. The PCA shows 3 factors with an eigenvalue higher than 1, of which the passion for inventing items load on factor 1, the passion for founding items load on factor 3, and the passion for developing items load on factor 2. To conclude, The scale can be used to measure the three domains of entrepreneurial passion.

3.3.1 Assumptions testing of the statistical tests

In the results section, first a paired t-test is applied in order to statistically determine whether causation or effectuation has the preference in Malaysia. For this purpose a Shapiro Wilk's test is performed in order to see whether the two variables are normally distributed. Both effectuation ($SW(81) = 0.98$, $p=0.25$) and causation ($SW(81) = 0.97$, $p = 0.053$) are normally distributed (appendix 10.6).

As testing the hypotheses is the main focus of this thesis, which will be conducted via multiple linear regression, it is essential to examine the assumptions: **(1)** linearity between the independent variables and dependent variable, **(2)** independence of errors, **(3)** constant error variance and **(4)** normally distributed errors (Osborne & Waters, 2002).

(1) As for linearity, partial regression plots are produced in which the least squares regression line is added together with the locally adjusted regression curve (loess). The closer the loess to the regression line, the more linear the relationship. **(2)** As for independence of errors, the data was collected from a random sample, meaning that the observations and hence the errors are independent. **(3)** For constant error variance, the predicted values are plotted against the studentized residuals, which should be randomly scattered. **(4)** For testing normally distributed errors, the histogram of the studentized residuals should show a normal distribution, and the normal Q-Q plot should show that the observations are close to the line. In appendix 10.7 the 4 assumptions can be found for each hypothesis.

Overall, the assumptions seem to hold for each hypothesis except for some small deviations in the linearity between the

independent and dependent variables, but in particular for normally distributed errors. For this purpose the Cook's Distance is calculated in order to check for influential cases: they are observations 'which, either individually or together with several other observations, have demonstrated larger impact on the calculated values of various estimates… than is the case for most other observations' (Belsley et al., 1980, p.11). When the observation has a Cook's D which was larger than $(\frac{4}{n-k-1})$ = 0.0547 it was assumed to be influential (Bollenand & Jackman, 1985). For each hypothesis multiple influential cases (appendix 10.8) are found, which were removed in the respective regression model after having made sure that it was not due to a data entry error. In order to assess the impact of the influential cases, a sensitivity analysis is performed by conducting the analysis with (appendix 10.10) and without influential cases (appendix 10.11) (Stevens, 1984). In the results section, the regression models excluding the influential cases are described.

A last important aspect to consider is multicollinearity, which is measured by the Variance Inflation Factor (VIF). As rule of thumb, a VIF value of 10 and higher is often considered to represent multicollinearity (e.g. O'Brien, 2007). No VIF values of this kind are found (appendix 10.11).

3.4 Control variables

Besides the variables that were used as criteria to filter out irrelevant cases, it is also essential to assess whether other variables have an influence on the dependent variable. As we want to see whether there is a relationship between entrepreneurial passion and the preference for causation or effectuation, it is important to also assess the impact of control variables. Gender, age, following entrepreneurial courses and knowing what effectuation means are used as control variables.

In order to assess whether there is a relationship between the control variables and dependent variable, a correlation analysis is performed. This way it is easy to see whether the control variables have a relationship with either of the dependent variables: effectuation or causation. As the variables mainly have an ordinal measurement level, the non-parametric Spearman's rho is used. The correlation matrix (appendix 10.3) show that neither of the control variables has a significant p-value for effectuation: gender (r = 0.138, p = 0.221), age (r = 0.125, p = 0.274), entrepreneurial courses (r = 0.051, p = 0.651) and familiarity with effectuation (r = -0.39, p = 0.731). There is also no statistically significant relationship between effectuation and causation (r = -0.61, p = 0.587).

Causation on the other hand has two control variables with a significant p-value: with entrepreneurial courses (r = -0.260, p = 0.019) and with familiarity with effectuation (r = -0.234, p = 0.036). As the correlation is negative, it means that when entrepreneurs have taken entrepreneurial courses, they are less inclined to use causal decision making processes. When entrepreneurs are familiar with effectuation, they use causation less. In next chapter, the relationship between the control variables and dependent variables are further scrutinised.

4. RESULTS

In this chapter the results are discussed. First of all the descriptive statistics are described, then a paired samples t-test is applied in order to analyse whether effectuation or causation has the preference in Malaysia, and lastly the results of the hypotheses are discussed. For the statistical tests $\alpha = 0.05$ and two-tailed p-values are used, unless stated otherwise. Two-tailed tests are used when talking about a significant difference, and one-tailed tests are used when looking in a specific direction (i..e positive or negative).

4.1 Descriptive statistics

Table 1 displays the descriptive statistics of effectuation/causation, and table 2 serves to display the statistics of entrepreneurial passion.

4.1.1 Effectuation and causation

n = 81		**Mean**	**SD**
Construct	**Effectuation**	**4.36**	**1.28**
	Causation	**5.04**	**0.84**
Basis for taking actions	Means oriented	4.22	1.64
	Goals oriented	5.17	1.29
Predisposition towards risk and resources	Affordable loss	4.68	1.56
	Expected returns	5.00	1.49
Attitude towards unexpected contingencies	Exploiting contingencies	4.80	1.55
	Exploiting pre-existing knowledge	3.98	1.67
Attitude towards outsiders	Strategic alliance	4.51	1.41
	Competitive analysis	5.79	0.89
View of the future	Controlling the unpredictable future	3.58	1.78
	Predicting the uncertain future	5.28	1.14

Table 1 – Descriptive statistics effectuation / causation

Considering the means of effectuation and causation as a construct, it is apparent that the entrepreneurs in the sample tended to prefer causal decision making processes (mean 5.04, SD 0.84) over the effectual variant (mean 4.36, SD 1.28). Looking at the 5 principles, it becomes clear that typically causation is preferred: entrepreneurs tend to take actions on the basis of goals (mean 5.17, SD 1.29), do business on the basis of expected returns (mean 5.00, SD 1.49), apply competitive analysis (mean 5.79, SD 0.89) and predict the uncertain future (mean 5.28, SD 1.14). However, the principle 'attitude towards unexpected contingencies' displays a change, as exploiting contingencies (mean 4.80, SD 1.55) precedes exploiting pre-existing knowledge (mean 3.98, SD 1.67). Here the effectual approach is preferred above the causal approach.

Thus, except for principle 'attitude towards unexpected contingencies', the preference for causation precedes effectuation.

4.1.2 Entrepreneurial passion

	Mean	**SD**
Passion for inventing	**6.06**	**0.64**
Passion for founding	**5.84**	**0.91**
Passion for developing	**5.85**	**0.93**

Table 2 – Descriptive statistics entrepreneurial passion

Considering entrepreneurial passion, the three domains are of main interest. In table 2 the means of the domains can be found and the descriptive statistics of all items are shown in appendix 10.4.2. What is remarkable, is that all items have very similar scores, where the lowest mean is 5.69 and the highest mean 6.22. To reflect on the three domains, passion for

inventing has mean 6.06 and SD 0.64, passion for founding has mean 5.84 and SD 0.91, and passion for developing has mean 5.85 and SD 0.93. Thus, all three domains have equal scores, where passion for inventing has the highest mean.

4.2 Effectuation versus causation

As it is stated that it is essential to further explain effectuation theory by doing research in different settings, first the statistical differences between effectuation and causation in Malaysia are explained on the basis of a paired-samples t-test (α=0.05). In appendix 10.5 the results are found.

First of all, looking at the effectuation and causation construct, it becomes apparent that there is a difference in the mean scores (4.36 vs. 5.04). There is also a statistically significant difference between effectuation and causation ($t(80)$, $p < 0.001$). The confidence interval shows that 95% of the times that a similar sample is taken from the population, the effectuation score will be between 1.04 and 0.34 points lower than causation. Thus, statistically speaking, novice entrepreneurs in Malaysia have a preference for causation.

Next to this, as effectuation and causation comprise of 5 principles, it is of interest to compare the principles (appendix 10.5). For the principle 'basis for taking actions' the causal approach 'goal orientation' is significantly higher than the effectual approach 'means orientation' ($t(80)$, $p < 0.001$). For the principle 'predisposition towards risk and resources', there is no statistically significant difference between the effectual approach 'affordable loss' and the causal approach 'expected returns' ($t(80) = 1.344$, $p = 0.183$). The principle 'attitude towards unexpected contingencies' shows that the effectual approach 'exploiting contingencies' is significantly higher from the causal approach 'exploiting pre-existing knowledge' ($t(80)$, $p = 0.002$). The principle 'attitude towards outsiders' has a statistically significant difference between the effectual approach 'strategic alliance' and the causal approach 'competitive analysis' ($t(80) = -6.60$, $p < 0.0001$), where applying competitive analyses has the preference. Lastly, the principle 'view of the future' once more shows a statistically significant preference for the causal approach 'predicting the uncertain future' over the effectual approach 'controlling the unpredictable future' ($t(80) = -7.12$, $p < 0.001$)

To conclude, all principles show that the causal approach has significantly higher scores than the effectual approach, except for the principle 'attitude towards unexpected contingencies', where the effectual approach is significantly higher than the causal approach. The principle 'predisposition towards risk and resources' shows no significant preference.

4.3 Hypothesis 1

H1: Novice entrepreneurs who posses high levels of passion for inventing tend to use the effectual approach 'exploiting contingencies', as opposed to using the causal approach 'exploiting pre-existing knowledge'.

In order to test the hypothesis, first a correlation analysis is applied followed by Hierarchical Linear Modelling (HLM). The first gives an initial insight whether there is a relationship, and the HLM enables the identification of the effect of solely the control variables as well as all the independent variables in the full model.

First of all, the correlation matrix (appendix 10.13) shows that there is a significant positive association between passion for inventing and exploiting contingencies: ($r = 0.187$, $p = 0.0475$, one-tailed). Next, there is no significant relationship between passion for inventing and exploiting pre-existing knowledge ($r = 0.055$, $p = 0.623$). Besides this, there is a significant association between passion for founding and exploiting pre-existing knowledge ($r = 0.275$, $p = 0.013$). This means that it is possible that passion for inventing has a positive effect on the preference for exploiting contingencies, but contradictory it might also be that passion for founding counters this as it has a positive effect on the preference for pre-existing knowledge.

Next the HLM is applied (appendix 10.11.1), consisting of two models. Model 1 comprises solely the control variables, while model 2 incorporates all variables. Model 1 with the control variables shows that there are no variables with a significant effect on exploiting contingencies. The control variables by itself explains 3% of the variation (R-square) in the dependent variable. The full model comprising of all variables, shows that passion for inventing has a significant positive effect (beta = 0.620, $p = 0.033$ one-tailed). The full model explains 12.8% more variation than the model with control variables, which is a significant increase (p=0.023).

As the correlation matrix showed a possible relationship between passion for founding and exploiting pre-existing knowledge, it is also essential to examine this. By looking at the HLM for causation (appendix 10.11.2), it becomes clear that the control variables are no significant predictors for exploiting pre-existing knowledge. Looking at the model with all independent variables, passion for founding has a significant effect on exploiting pre-existing knowledge: (beta = 0.660, $p = 0.019$). The beta tells that the effect of passion for founding on exploiting pre-existing knowledge is positive.

Thus, passion for inventing has a significant positive effect on using the effectual approach 'exploiting contingencies' as opposed to the causal approach 'exploiting pre-existing knowledge'. This means that proof is found in favour of the hypothesis, which we can thus accept. Besides, the analysis showed that passion for founding positively affects using the causal approach 'exploiting pre-existing knowledge' as opposed to the effectual approach 'exploiting contingencies'.

4.4 Hypothesis 2

H2: Novice entrepreneurs who have high levels of passion for founding tend to use the causal approach 'goals orientation', as opposed to using the effectual approach 'means orientation'.

First of all, reflecting the correlation analysis (appendix 10.13), it is apparent that passion for inventing ($r = 0.363$, $p = 0.001$) and passion for developing ($r = 0.272$, $p = 0.014$) have a significant association with the goal oriented approach. Passion for founding has a significant positive association, looking at the one-tailed test ($r = 0.213$, $p = 0.028$). Therefore, the HLM is used to further assess the relationships. There are no correlations found between the entrepreneurial passion domains and the means oriented approach.

Applying the HLM (appendix 10.11.3) for the dependent variable 'means oriented approach', it can be seen in model 1 that neither of the control variables is a significant predictor for the means-oriented approach. In model 2, consisting of all variables there are also no significant predicting variables. The full model only accounts for 5.5% explained variance, which is 2% more than the model comprising of just the control variables.

Looking at the regression analysis for the model with the dependent variable 'goals oriented approach' (appendix 10.11.4), the control variable 'having had entrepreneurial courses' has a significant effect (beta = -0.589, $p = 0.05$). However, when looking at the full model, it becomes clear that

only passion for inventing (beta = 0.771, p = 0.001) is a significant predicting variable for using the goals oriented approach. Looking at the beta, it can be concluded that passion for inventing has a significant positive relationship with the goals oriented approach. The full model explains 26.3% of the variance of the dependent variable, 20.3% more than the model with solely the control variables. This is a significant change (p = 0.001).

Concluded, passion for inventing has a significant positive effect on using the causal approach 'goals orientation' as opposed to the effectual approach 'means orientation'. There is no proof that supports the stated hypothesis.

4.5 Hypothesis 3

H3: Novice entrepreneurs with high levels of passion for developing tend to use the causal approach 'expected returns', as opposed to using the effectual approach 'affordable loss'.

The correlation matrix (appendix 10.13) shows a significant association between passion for founding and using the expected returns approach (r = 0.283, p = 0.011), as well as passion for developing and the expected returns approach (r = 0.381, p<0.001). This gives an initial indication that the hypothesis might be accepted. The entrepreneurial passion domains do not have significant associations with the affordable loss approach.

The HLM (appendix 10.11.6) further strengthens the aforementioned findings. To first start with the expected returns approach, model 1 consisting of the control variables, displays a significant effect of having had entrepreneurial courses (beta = -0.949, p = 0.009) on the extent of using the expected returns approach. However, the full model consisting of all variables, shows that having had entrepreneurial courses has no significant effect. The main findings are that passion for inventing has a significant negative effect (one sided) on using the expected returns approach (beta = -0.400, p = 0.029). Passion for developing has a significant positive effect (beta = 0.746, p<0.001) on using the expected returns approach, which is in line with the stated hypothesis. Additionally, also passion for founding has a significant (positive) effect on using expected returns (beta = 0.404, p = 0.014). This model including all variables explains 41.8% of the variance in the dependent variable 'expected returns' , which is 29.7% more than solely the control variables. This is a significant change (p <0.001).

Lastly it is necessary to examine the effect of the independent variables on the affordable loss approach. The full model with all independent variables (appendix 10.11.5) shows that besides age (beta = 0.884, p = 0.012), there are no significant predictors for the dependent variable 'affordable loss'. The full model explains 14.3% of the variance, only 1.9% more than the base model consisting of only the control variables. This is not a significant increase (p = 0.695).

To conclude, proof is found that the hypothesis can be accepted. Passion for developing has a significant positive effect on using the causal approach 'expected returns'. Additionally, passion for founding also positively affects the causal approach 'expected returns', whereas passion for inventing showed a negative significant effect on the use of expected returns.

4.6 Hypothesis 4

H4: Novice entrepreneurs who are most passionate about inventing tend to use effectual decision making processes, as opposed to novice entrepreneurs with high levels of passion for founding and developing.

The correlation matrix (appendix 10.13) depicts that neither of the entrepreneurial passion domains has a significant association with effectuation. However, all three domains do have a significant association with causation as a construct. Passion for inventing (r = 0.275, p = 0.013), passion for founding (r = 0.393, p <0.001), and passion for developing (r = 0.391, p <0.001).

In the HLM (appendix 10.11.7) the relationships can be established further. For effectuation as a construct, there are no significant effects in both the model comprising the control variables and the model comprising all variables. Only 3.5% of the variance in the model is explained by all independent variables.

For causation in the model comprising of all variables (appendix 10.11.8), having had entrepreneurial courses has a significant effect (beta = -0.358, p = 0.041). Looking at the beta, it can be seen that the effect is negative. Furthermore, it can be seen that passion for developing (beta = 0.279, p = 0.003) has a significant effect on causation. The beta tells that this effect is positive. Passion for inventing (b1 = 0.241, p = 0.035 one-tailed) has a significant positive effect on the use of causation. The independent variables in this model account for 38.4% of the variance, 22.8% more than the control variables which is a significant change (p <0.001).

To conclude, there is no evidence that supports the hypothesis. Passion for inventing has no significant effect on using effectual decision making processes, just as the other entrepreneurial passion domains. On the contrary, passion for inventing has a significant positive effect on using causal decision making processes. Passion for developing was found to have a significant positive effect on causation as well.

5. DISCUSSION & CONCLUSION

5.1 Discussion

Looking back at the introduction, it was emphasised that it is highly required to further develop effectuation theory. Not only the influencing factors need to be scrutinised, but also the prevailing preference for effectuation and causation in different settings. On the basis of the paired t-tests, it can be said that causal decision making processes are preferred by novice Malaysian entrepreneurs. This is in line with the current effectuation theory, which states that effectuation is in essence not a theory for novice entrepreneurs, but for expert entrepreneurs (Sarasvathy, 2001). The more working experience and knowledge entrepreneurs have, the more likely they are to employ the emergent approach rather than the planned approach.

Additionally, the five principles of effectuation and causation were compared. Amongst the novice Malaysian entrepreneurs, typically the causal approach was preferred, except for the principle 'attitude towards unexpected contingencies'. Here the effectual approach 'exploiting contingencies' was used significantly more than the causal approach 'exploiting pre-existing knowledge'. Novice Malaysian entrepreneurs thus do embrace contingencies and surprises in the environment. This can help them with capitalizing opportunities, leading to greater entrepreneurial success (Morris et al., 1999).

Considering the control variables, a significant association was identified between the preference for causation and having had entrepreneurial courses, which is in line with the findings of Dew et al. (2009). On the same note, being familiar with the concept of effectuation is negatively associated with causation, which underlined that effectuation and causation are in fact two separate constructs.

When looking back at the introduction, Arend et al. (2015) stressed the need to examine the factors that might influence the use of effectuation and causation. Murnieks et al. (2014) indicated that there is an association between passion and entrepreneurial behaviour, but the role that entrepreneurial passion plays in effectuation and causation was to our best knowledge not yet researched. This thesis shows that entrepreneurial passion indeed has a significant relation with the decision making processes of entrepreneurs. Proof was found in favour of the first and third hypothesis. Passion for inventing seems to have a significant positive effect on using the effectual approach 'exploiting contingencies'. Novice Malaysian entrepreneurs thus follow what is best according to theory (Cardon et al. (2013). When inventing, it is most effective to be responsive to the dynamic entrepreneurial environment and thus to exploit contingencies. An additional finding is that passion for founding has a significant positive effect on the causal approach 'exploiting pre-existing knowledge'. This could be due to the fact that founding businesses is a risky operation, which could for example be seen in 90% of all start-ups failing (Patel, 2015). When exploiting pre-existing knowledge, entrepreneurs have a pre-set plan which they follow in order to reduce risk (Sarasvathy & Dew, 2005).

In line with theory, passion for developing has a positive effect on using the causal approach 'expected returns'. Novice Malaysian entrepreneurs who have high levels of passion for developing assess the profitability potentials of investment decisions, in order to develop their business. On the other hand, passion for inventing seems to lead to employing the causal approach 'expected returns' less. This can be explained through the fact that entrepreneurs who have high levels of passion for inventing have to constantly redesign and re-evaluate their product offerings. Many novice entrepreneurs have limited experience and it is thus difficult to estimate expected returns on products and services which are not yet available in the market. An additional finding is that also passion for founding has a significant effect on using expected returns, which in this case is positive. This means that entrepreneurs who have passion for founding tend to calculate profit potentials and expected returns, which can also be described by the -risky nature of founding businesses. In order to reduce risk, business potentials are thoroughly calculated and when deemed profitable, the businesses are actually founded.

The findings furthermore show that hypothesis two and four had to be rejected. It is not passion for founding that has an effect on using the causal approach 'goals orientation', but rather passion for inventing. This means that entrepreneurs first set goals in their inventing endeavours, before acquiring the necessary knowledge and awareness of market gaps, expertise and networks. Thus, novice Malaysian entrepreneurs do not invent because they see an opportunity in the market, but mainly because they have set goals and objectives which they aim to achieve.

In contrast to theory, passion for inventing does not seem to have a significant effect on the construct effectuation. Instead, passion for inventing has a significant positive effect on using causation. This insinuates that entrepreneurs who enjoy inventing, use a planned approach to explore new opportunities. This is remarkable, as theory suggests that entrepreneurs with high levels of passion for inventing could better use an emergent approach in order to explore possibilities in the environment and to further improve their product offering. Passion for developing was also found to have a significant positive effect on using causation, which could be expected given that entrepreneurs who want to develop their venture often set goals and plans before the start of projects. The success of the venture is often assessed on the basis of pre-set Key Performance Indicators (KPIs).

5.2 Conclusion

This thesis examined and described the relationship between entrepreneurial passion and effectuation/causation. The research question of this thesis was:

To what extent does entrepreneurial passion influence the choice between effectual and causal decision making processes of novice entrepreneurs?

By combining the literature of entrepreneurial passion and effectuation/causation, hypotheses were set up in order to explain the influence of entrepreneurial passion. However, in half of the cases practice did not follow theory. Hypothesis 1 and 3 could be accepted, while hypotheses 2 and 4 had to be rejected. However, the analysis showed that entrepreneurial passion is certainly related to the preference of Malaysian novice entrepreneurs for either effectuation or causation. Passion for founding has a significant positive effect on the causal approach 'exploiting pre-existing knowledge' and the causal approach 'expected returns'. Passion for inventing positively affects the effectual approach 'exploiting contingencies', the causal approach 'goals orientation' and causation as construct, and negatively affects the causal approach 'expected returns'. Passion for developing has a significant positive effect on using the causal approach 'expected returns' and causation as construct (appendix 10.12).

Even though the relationships were in some cases not according to theory, the thesis showed that entrepreneurial passion seems to be an influencing factor in the choice between effectual and causal decision making processes. This gap between theory and practice is important to realise, as it can help entrepreneurs to make better decisions in their organisational endeavours. This is further explained in the next section 'relevance'.

6. RELEVANCE

6.1 Academic relevance

Research in the field of effectuation is still underdeveloped and lacks an embracing theoretical framework consisting of all the influencing factors. Especially entrepreneurial passion is still a relatively new field that has not yet been comprehensively considered in the effectuation literature. Performed studies mainly relied on a broad passion description and scale from Vallerand et al. (2003) (e.g. Stroe, Parida, Wincent, 2018), whereas this thesis used the distinct concept and scale of entrepreneurial passion as identified by Cardon et al. (2009; 2013). Therefore, this research adds new insights into entrepreneurial passion as well as the effect of entrepreneurial passion on the preference for either effectuation or causation. Furthermore, the study offers a necessary additional empirical analysis of the preference for effectuation amongst novice entrepreneurs (Perry et al., 2012).

6.2 Practical relevance

The thesis helps entrepreneurs in the sense of whether it is better to use a causal or effectual decision making process, on the basis of their level of entrepreneurial passion. It might be helpful for entrepreneurs to realise that it might be better to use effectuation or causation depending on whether they enjoy inventing, founding or developing. This might help them in the decision making processes of their new ventures, which ultimately could help them to sustain and grow their business. It might also be of interest to the government, incubators and others who support new venture creation. They could use the outcomes to better support entrepreneurs.

7. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

Although the thesis has provided more insights into the role entrepreneurial passion plays in effectuation and causation theory, there are some limitations that need to be scrutinised. First, effectuation theory is still a relatively new field of research which has received criticism. In particular it is the theory proposed by Sarasvathy, who also defined the five core principles of effectuation and causation. However, as effectuation theory is still lacking sufficient proof (e.g. Arend et al, 2015), it is necessary to assemble more theoretical and empirical proof in order to get an ubiquitous theory. More research is required in terms of why, how, when and where to use effectual and causal reasoning.

This research also has its limitations with regards to the methodology. It is possible that the sample did not fully reflect the population. Via online media random entrepreneurs were approached, but this resulted in a low response rate. Bazaars were visited in which entrepreneurs' were asked to fill in the survey, which constitutes almost 50% of the sample size. The bazaars attract a certain type of entrepreneur depending on the theme, which might not fully reflect the population. In the light of this thesis, a sample size of 81 Malaysian novice entrepreneurs was collected, but in order to further research the effect of entrepreneurial passion on effectuation/causation, data from more countries and more subjects should be collected. This study is after all solely focused on Malaysian novice entrepreneurs, but different settings might show different results.

Also the survey itself might have led to less optimal results. The survey was part of a larger research consisting of more scales, and did thus not only contain items related to entrepreneurial passion and effectuation/causation. The length of the survey was therefore rather long, which might have led to response fatigue (Bradly & Daly, 1994). For future research it would be wise to solely include effectuation/causation and entrepreneurial passion items in the survey.

The Cronbach's Alpha for the construct 'causation' showed a value of 0.620, lower than the minimum of 0.7. As there were good reasons for this lower value, the causation items were kept in its original state and used in the analysis. However, this scenario was not ideal and it might have resulted in different outcomes and conclusions. Therefore, future research should aim to assure the internal consistency of the items for causation (Cronbach's Alpha > 0.7).

For the entrepreneurial passion domains, it would be good to more closely examine why the domains have such equal means. Solely looking at the means, there is only a very small difference between the three domains. Also, looking at the items, there are barely numerical differences. Even though the factor analysis showed that the items were measuring the correct domain, the findings are remarkable and it says that novice Malaysian entrepreneurs have approximately equal levels of passion for inventing, founding and developing.

Next, as the analysis showed that some of the control variables influenced the dependent variable of interest, it is necessary to further examine the influence of these sort of variables. Although this study showed that the R-square in many cases increased significantly when the entrepreneurial passion domains were added to the initial model consisting of the control variables, it still might be that other control variables should be added to the model in order to assess what the effect of entrepreneurial passion then would be.

The assumptions of multiple linear regression need to be scrutinised. The thesis showed that generally the assumptions seem to be met. However, upon checking the assumptions of linearity and normally distributed errors, there can be discussion about whether the assumptions are met or violated. Therefore, future research should aim to further scrutinise the regression model in order to have a model which is proved to be valid and reliable. This will help to better capture the true population parameters.

Lastly, three of the four hypotheses were tested by using the separate principles of effectuation and causation. It is questionable whether these sub-dimensions are properly measured. Each principle is namely measured by only one question of the Alsos scale (2014), which has as result that the question might not address the core of the principle. Nevertheless, the current measure for the separate principles still gives valuable information as for whether the effectual or causal approach is preferred. In order to have a better measure for the sub-dimensions, future research should include a ubiquitous measurement instrument that covers the principles with high reliability and validity.

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10. APPENDIX

10.1 Sample demographics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	79	22	60	31.95	6.547
How many years (or months) has your company existed for?	81	1	5	2.51	1.392
How many years have you been an entrepreneur? (please fill in whole numbers)	81	.5	5.0	2.599	1.3839
Valid N (listwise)	79				

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	26	32.1	32.1	32.1
	Female	53	65.4	65.4	97.5
	Other	2	2.5	2.5	100.0
	Total	81	100.0	100.0	

10.2. Data analysis

10.2.1 Cronbach Alphas

Effectuation

Reliability Statistics

Cronbach's Alpha	N of Items
.864	5

Causation

Reliability Statistics

Cronbach's Alpha	N of Items
.620	5

Passion for inventing

Reliability Statistics

Cronbach's Alpha	N of Items
.825	5

Passion for founding

Reliability Statistics

Cronbach's Alpha	N of Items
.821	4

Passion for developing

Reliability Statistics

Cronbach's Alpha	N of Items
.847	4

10.2.2 Factor analyses

10.2.2.1 Factor analysis effectuation/causation

Correlation Matrix[a]

		Causation_1	Causation_2	Causation_3	Causation_4	Causation_5	Effectuation_1	Effectuation_2	Effectuation_3	Effectuation_4	Effectuation_5
Correlation	Causation_1	1.000	.344	.308	.401	.373	-.177	-.196	-.170	-.097	-.245
	Causation_2	.344	1.000	.095	.216	.315	-.015	.005	.049	.054	-.113
	Causation_3	.308	.095	1.000	.189	.219	.211	.011	-.026	.058	.034
	Causation_4	.401	.216	.189	1.000	.219	-.215	.005	-.057	-.114	-.222
	Causation_5	.373	.315	.219	.219	1.000	.066	.200	.074	-.044	-.039
	Effectuation_1	-.177	-.015	.211	-.215	.066	1.000	.542	.561	.546	.741
	Effectuation_2	-.196	.005	.011	.005	.200	.542	1.000	.486	.372	.551
	Effectuation_3	-.170	.049	-.026	-.057	.074	.561	.486	1.000	.670	.562
	Effectuation_4	-.097	.054	.058	-.114	-.044	.546	.372	.670	1.000	.570
	Effectuation_5	-.245	-.113	.034	-.222	-.039	.741	.551	.562	.570	1.000

a. Determinant = .029

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.376	33.765	33.765	3.376	33.765	33.765	3.337	33.372	33.372
2	2.078	20.779	54.544	2.078	20.779	54.544	2.117	21.172	54.544
3	.982	9.822	64.366						
4	.837	8.375	72.741						
5	.803	8.031	80.772						
6	.577	5.770	86.542						
7	.481	4.810	91.352						
8	.349	3.491	94.842						
9	.292	2.916	97.758						
10	.224	2.242	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix[a]

	Component	
	1	2
Causation_1	-.227	.763
Causation_2	.018	.614
Causation_3	.120	.520
Causation_4	-.174	.616
Causation_5	.110	.690
Effectuation_1	.857	-.010
Effectuation_2	.724	.064
Effectuation_3	.807	.013
Effectuation_4	.773	-.004
Effectuation_5	.849	-.162

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

a. Rotation converged in 3 iterations.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.749
Bartlett's Test of Sphericity	Approx. Chi-Square	267.572
	df	45
	Sig.	.000

10.2.2.2 Factor analysis entrepreneurial passion

Correlation Matrix[a]

		Passion_IPF_inv1	Passion_IPF_inv2	Passion_IPF_inv3	Passion_IPF_inv4	Passion_IC_inv5	Passion_IPF_fnd1	Passion_IPF_fnd2	Passion_IPF_fnd3	Passion_IC_fnd4	Passion_IPF_dev1	Passion_IPF_dev2	Passion_IPF_dev3	Passion_IC_dev4
Correlation	Passion_IPF_inv1	1.000	.610	.612	.290	.395	.152	.261	.396	.048	-.016	-.064	.002	-.013
	Passion_IPF_inv2	.610	1.000	.752	.522	.405	.175	.308	.491	.181	.102	.062	.143	.014
	Passion_IPF_inv3	.612	.752	1.000	.430	.466	.181	.387	.556	.179	.263	.148	.252	.166
	Passion_IPF_inv4	.290	.522	.430	1.000	.449	.200	.198	.238	.228	.218	.191	.261	.185
	Passion_IC_inv5	.395	.405	.466	.449	1.000	.158	.256	.376	.150	.257	.198	.171	.197
	Passion_IPF_fnd1	.152	.175	.181	.200	.158	1.000	.696	.381	.500	.374	.299	.197	.386
	Passion_IPF_fnd2	.261	.308	.387	.198	.256	.696	1.000	.623	.668	.297	.240	.269	.453
	Passion_IPF_fnd3	.396	.491	.556	.238	.376	.381	.623	1.000	.329	.190	.184	.181	.036
	Passion_IC_fnd4	.048	.181	.179	.228	.150	.500	.668	.329	1.000	.176	.170	.132	.440
	Passion_IPF_dev1	-.016	.102	.263	.218	.257	.374	.297	.190	.176	1.000	.829	.682	.399
	Passion_IPF_dev2	-.064	.062	.148	.191	.198	.299	.240	.184	.170	.829	1.000	.688	.345
	Passion_IPF_dev3	.002	.143	.252	.261	.171	.197	.269	.181	.132	.682	.688	1.000	.523
	Passion_IC_dev4	-.013	.014	.166	.185	.197	.386	.453	.036	.440	.399	.345	.523	1.000

a. Determinant = .001

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.757
Bartlett's Test of Sphericity	Approx. Chi-Square	568.784
	df	78
	Sig.	.000

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	4.675	35.962	35.962	4.675	35.962	35.962	3.671
2	2.463	18.949	54.912	2.463	18.949	54.912	3.122
3	1.638	12.598	67.510	1.638	12.598	67.510	3.238
4	.910	7.002	74.512				
5	.685	5.270	79.782				
6	.634	4.878	84.660				
7	.548	4.213	88.873				
8	.403	3.098	91.971				
9	.332	2.556	94.527				
10	.233	1.796	96.323				
11	.189	1.455	97.778				
12	.156	1.204	98.982				
13	.132	1.018	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Pattern Matrix[a]

	Component		
	1	2	3
Passion_IPF_inv1	.801	-.219	.001
Passion_IPF_inv2	.881	-.070	-.003
Passion_IPF_inv3	.852	.071	-.032
Passion_IPF_inv4	.599	.218	.033
Passion_IC_inv5	.638	.180	.024
Passion_IPF_fnd1	-.007	.085	-.791
Passion_IPF_fnd2	.163	-.010	-.878
Passion_IPF_fnd3	.545	-.086	-.428
Passion_IC_fnd4	-.046	-.063	-.859
Passion_IPF_dev1	.060	.883	-.038
Passion_IPF_dev2	-.001	.896	.001
Passion_IPF_dev3	.086	.865	.028
Passion_IC_dev4	-.132	.461	-.470

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

a. Rotation converged in 6 iterations.

10.3 Control variables correlation

Correlations

			Causation	Effectuation	Gender	Age	Entrepreneurial courses	Familiar with effectuation
Spearman's rho	Causation	Correlation Coefficient	1.000					
		Sig. (2-tailed)	.					
	Effectuation	Correlation Coefficient	-.061	1.000				
		Sig. (2-tailed)	.587	.				
	Gender	Correlation Coefficient	-.024	.138	1.000			
		Sig. (2-tailed)	.834	.221	.			
	Age	Correlation Coefficient	-.109	.125	-.084	1.000		
		Sig. (2-tailed)	.341	.274	.461	.		
	Entrepreneurial courses	Correlation Coefficient	-.260	.051	.076	.266	1.000	
		Sig. (2-tailed)	.019	.651	.502	.018	.	
	Familiar with effectuation	Correlation Coefficient	-.234	-.039	.134	.218	.134	1.000
		Sig. (2-tailed)	.036	.731	.238	.055	.235	.

10.4 Descriptive Statistics

10.4.1 Descriptive statistics Effectuation/Causation

Descriptive Statistics

	N	Mean	Std. Deviation
Causation_1_goals	81	5.17	1.292
Causation_2_exp_ret	81	5.00	1.492
Causation_3_Expl_knwl	81	3.98	1.673
Causation_4_Analysis	81	5.79	.890
Causation_5_predicting	81	5.28	1.143
Causation	81	5.0444	.83546
Effectuation_1_means	81	4.22	1.643
Effectuation_2_aff_loss	81	4.68	1.556
Effectuation_3_Expl_cont	81	4.80	1.553
Effectuation_4_alliance	81	4.51	1.406
Effectuation_5_control	81	3.58	1.781
Effectuation	81	4.3580	1.28207
Valid N (listwise)	81		

10.4.2 Descriptive statistics Entrepreneurial Passion

Descriptive Statistics

	N	Mean	Std. Deviation
Passion [It is exciting to figure out new ways to solve unmet market needs that can be commercialized.]	81	5.95	.893
Passion [Searching for new ideas for products/services to offer is enjoyable to me.]	81	6.11	.837
Passion [I am motivated to figure out how to make existing products/services better.]	81	6.22	.775
Passion [Scanning the environment for new opportunities really excites me.]	81	6.09	.693
Passion [Inventing new solutions to problems is an important part of who I am.]	81	5.93	.946
Passion_for_inventing	81	6.0593	.63910
Passion [Establishing a new company excites me.]	81	5.62	1.146
Passion [Owning my own company energizes me.]	81	5.90	1.158
Passion [Nurturing a new business through its emerging success is enjoyable.]	81	6.05	.960
Passion [Being the founder of a business is an important part of who I am.]	81	5.80	1.219
Passion_for_founding	81	5.8426	.90782
Passion [I really like finding the right people to market my product/service to.]	81	5.94	1.111
Passion [Assembling the right people to work for my business is exciting.]	81	5.69	1.147
Passion [Pushing my employees and myself to make our company better motivates me.]	81	5.79	1.137
Passion [Nurturing and growing companies is an important part of who I am.]	81	6.00	1.072
Passion_for_developing	81	5.8549	.92522
Valid N (listwise)	81		

10.5 Paired samples t-tests Causation / effectuation

10.5.1 Paired samples t-test effectuation - causation

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Causation	5.0444	81	.83546	.09283
	Effectuation	4.3580	81	1.28207	.14245

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	Effectuation - Causation	-.68642	1.57129	.17459	-1.03386	-.33898	-3.932	80	.000

10.5.2 Paired samples t-test effectuation_1 – causation_1

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Effectuation_1	4.22	81	1.643	.183
	Causation_1	5.17	81	1.292	.144

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	Effectuation_1 - Causation_1	-.951	2.263	.251	-1.451	-.450	-3.780	80	.000

10.5.3 Paired samples t-test effectuation_2 – causation_2

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Effectuation_2	4.68	81	1.556	.173
	Causation_2	5.00	81	1.492	.166

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	Effectuation_2 - Causation_2	-.321	2.150	.239	-.796	.154	-1.344	80	.183

10.5.4 Paired samples t-test effectuation_3 – causation_3

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Effectuation_3	4.80	81	1.553	.173
	Causation_3	3.98	81	1.673	.186

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	Effectuation_3 - Causation_3	.827	2.312	.257	.316	1.338	3.220	80	.002

10.5.5 Paired samples t-test effectuation_4 – causation_4

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Effectuation_4	4.51	81	1.406	.156
	Causation_4	5.79	81	.890	.099

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	Effectuation_4 - Causation_4	-1.284	1.748	.194	-1.670	-.897	-6.610	80	.000

10.5.6 Paired samples t-test effectuation_5 – causation_5

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Effectuation_5	3.58	81	1.781	.198
	Causation_5	5.28	81	1.143	.127

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	Effectuation_5 - Causation_5	-1.704	2.153	.239	-2.180	-1.228	-7.121	80	.000

10.6 Normality Shapiro Wilk Test for Effectuation and causation

Descriptives

			Statistic	Std. Error
Effectuation	Mean		4.3580	.14245
	95% Confidence Interval for Mean	Lower Bound	4.0745	
		Upper Bound	4.6415	
	5% Trimmed Mean		4.3558	
	Median		4.4000	
	Variance		1.644	
	Std. Deviation		1.28207	
	Minimum		1.40	
	Maximum		7.00	
	Range		5.60	
	Interquartile Range		1.90	
	Skewness		.092	.267
	Kurtosis		-.603	.529
Causation	Mean		5.0444	.09283
	95% Confidence Interval for Mean	Lower Bound	4.8597	
		Upper Bound	5.2292	
	5% Trimmed Mean		5.0606	
	Median		5.0000	
	Variance		.698	
	Std. Deviation		.83546	
	Minimum		3.00	
	Maximum		7.00	
	Range		4.00	
	Interquartile Range		1.20	
	Skewness		-.361	.267
	Kurtosis		-.283	.529

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Effectuation	.081	81	.200*	.980	81	.250
Causation	.100	81	.045	.970	81	.053

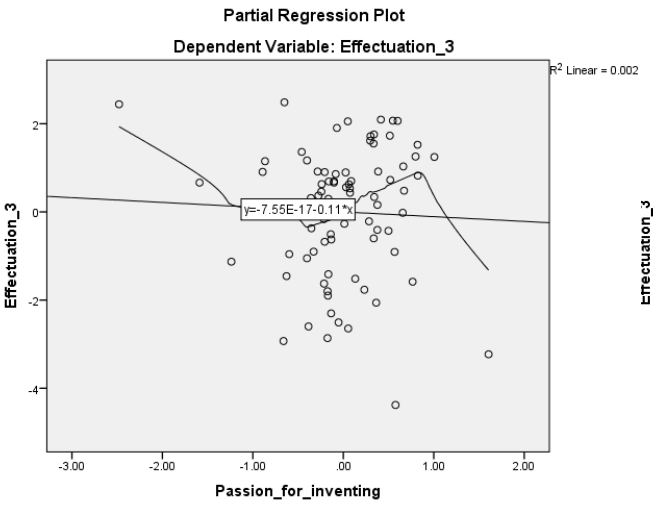
*. This is a lower bound of the true significance.

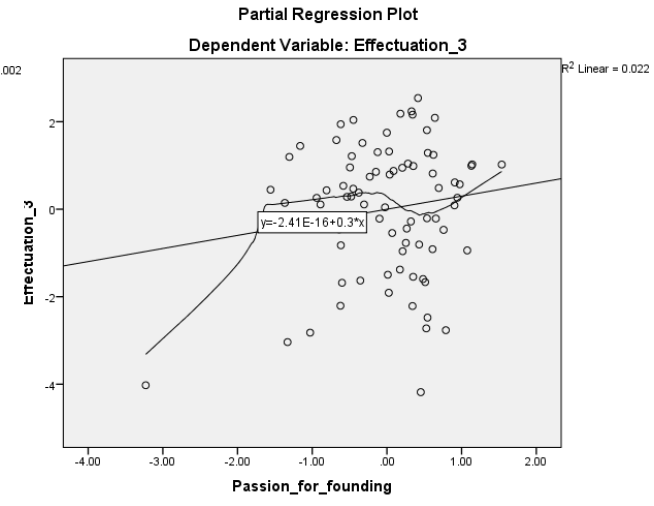
a. Lilliefors Significance Correction

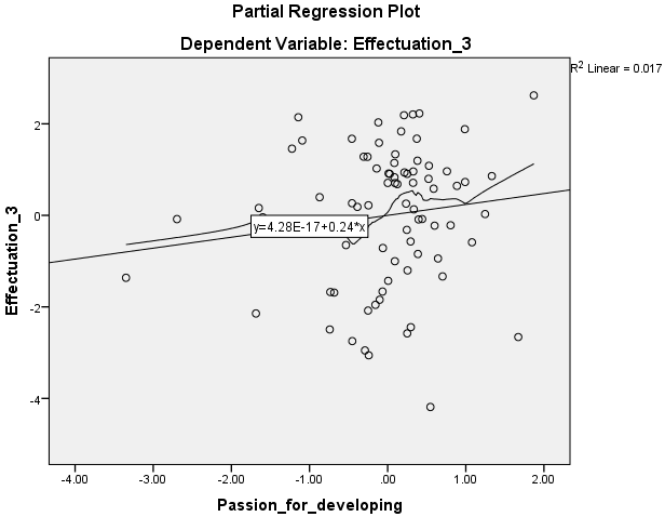
10.7 Assumptions Multiple linear regression

10.7.1 Hypothesis 1 – Effectuation

1. Linearity







2. Independence of errors

Model Summary[c]

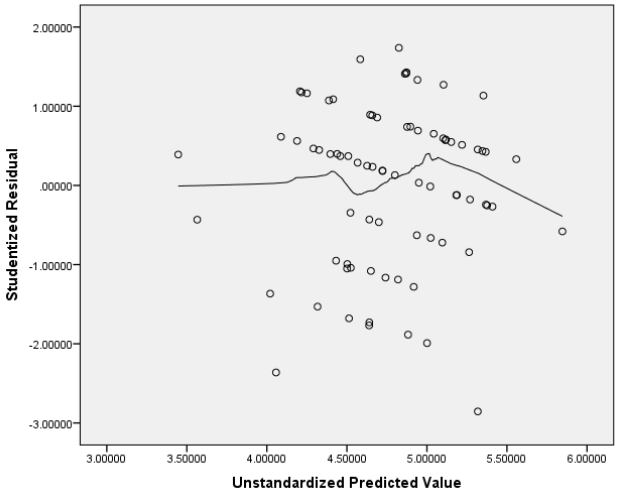
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.152[a]	.023	-.031	1.586	
2	.280[b]	.078	-.014	1.573	1.681

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

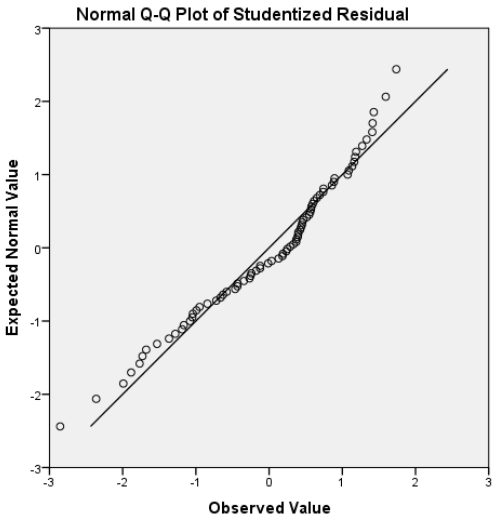
b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

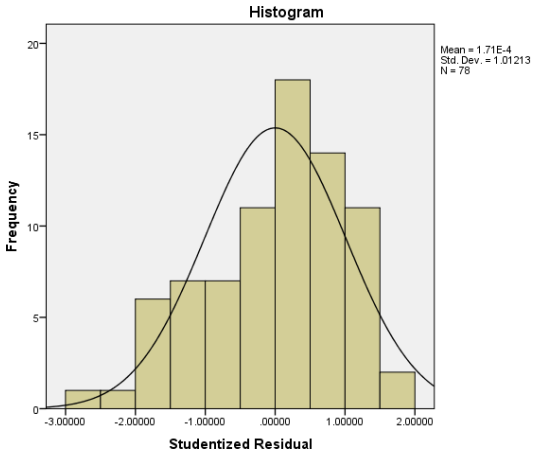
c. Dependent Variable: Effectuation_3

3. Constant error variance



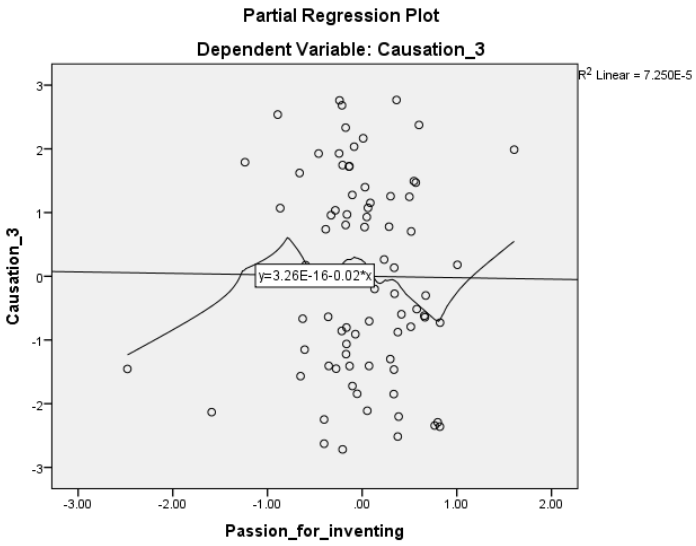
4. Normally distribution errors

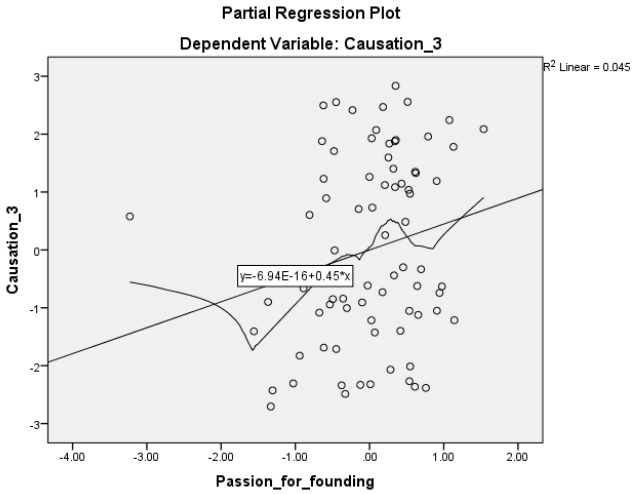


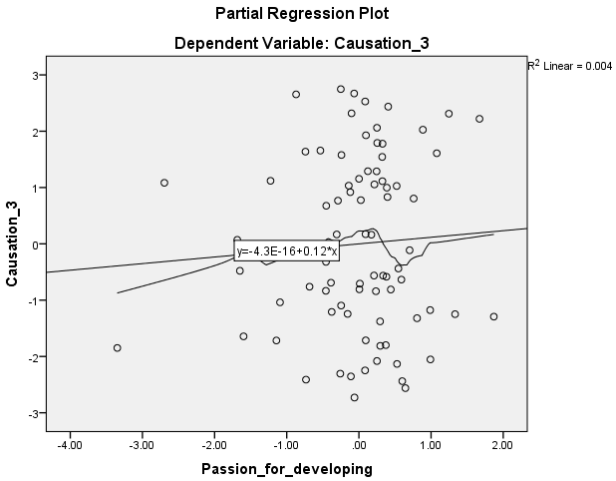


10.7.2 Hypothesis 1 Causation

1. Linearity







2. Independence of errors

Model Summary[c]

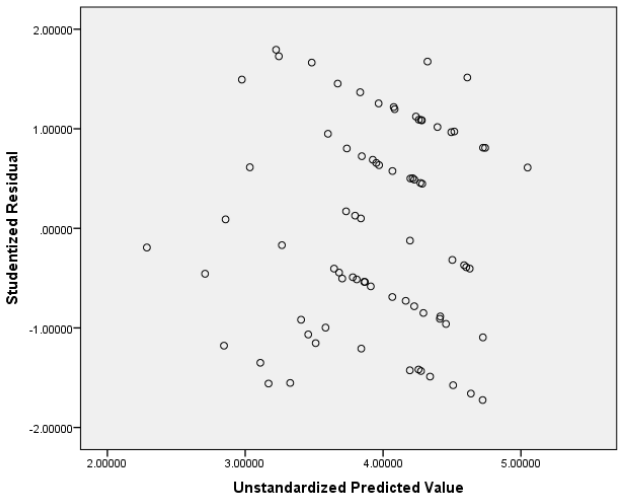
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.204[a]	.042	-.011	1.672	
2	.330[b]	.109	.019	1.646	1.999

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

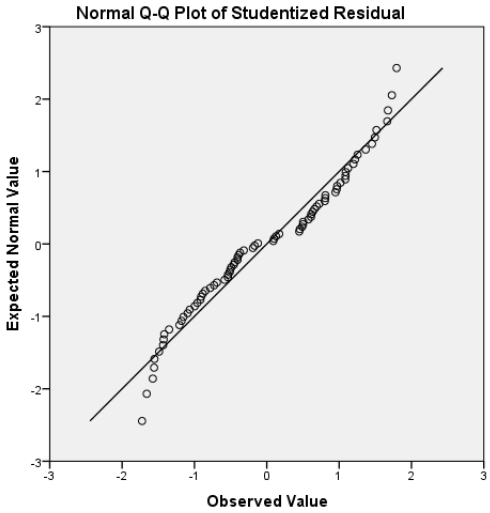
b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

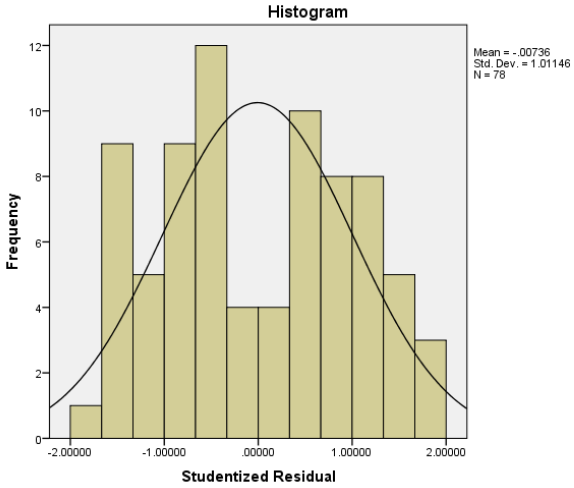
c. Dependent Variable: Causation_3

3. Constant error variance



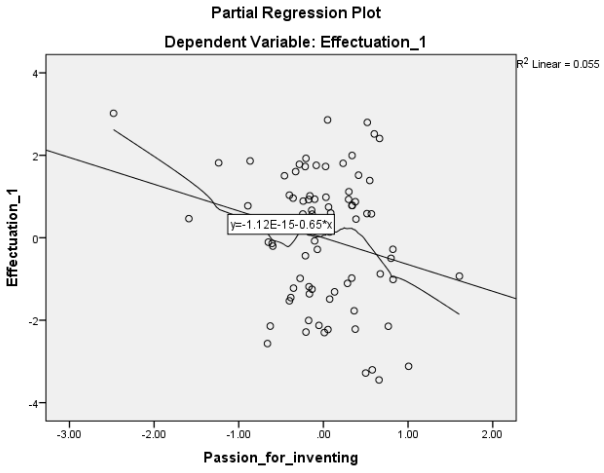
4. Normally distributed errors

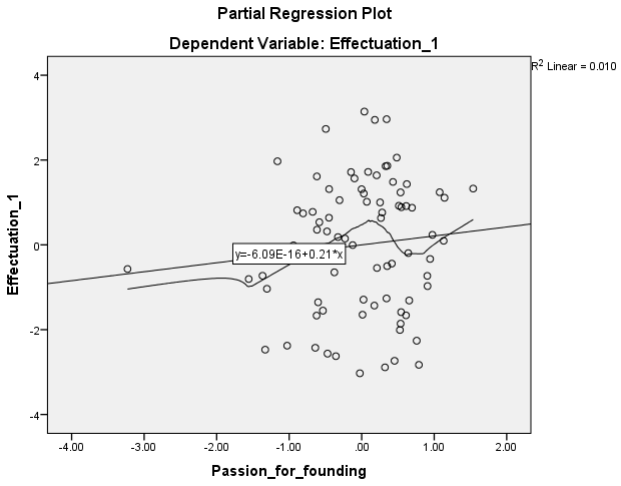


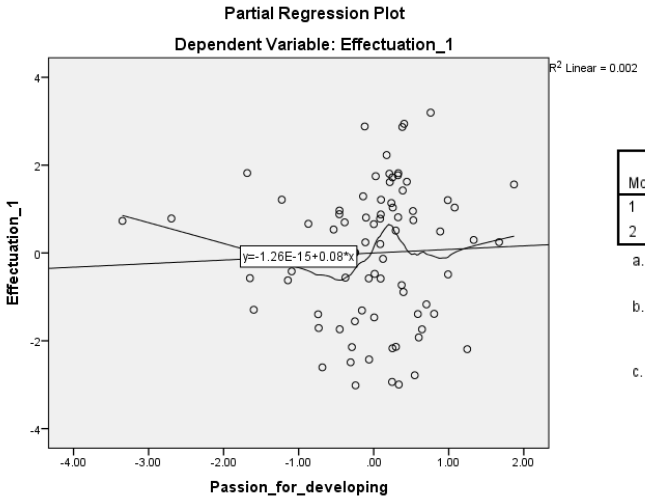


10.7.3 Hypothesis 2 – Effectuation

1. Linearity







Independence of errors

Model Summary[c]

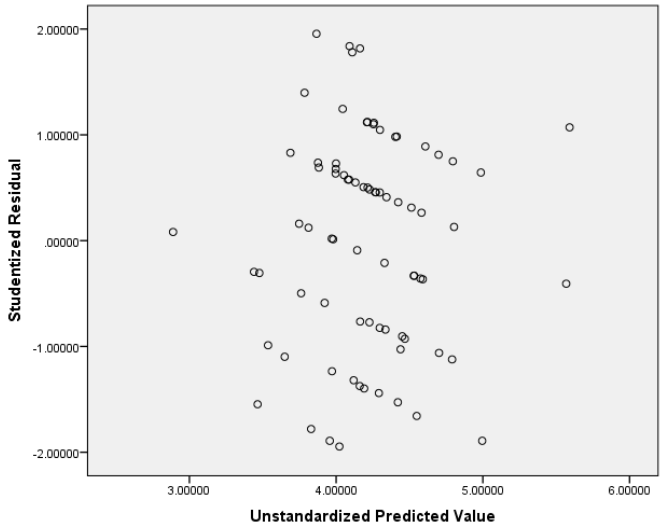
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.117[a]	.014	-.040	1.665	
2	.263[b]	.069	-.024	1.652	1.909

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

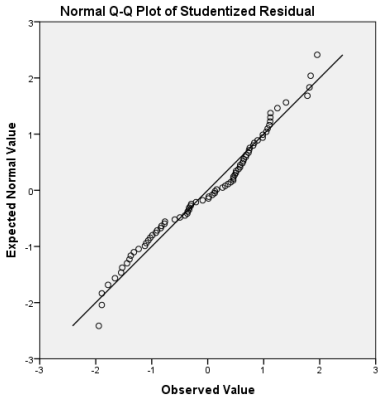
b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

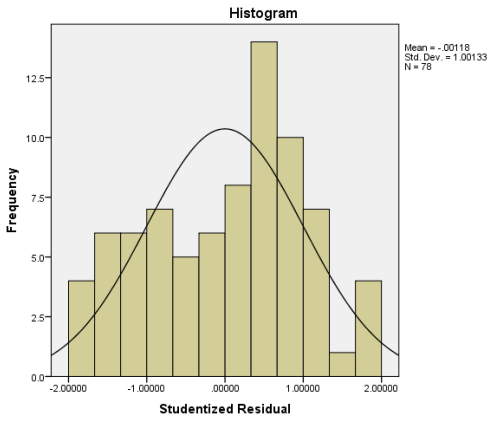
c. Dependent Variable: Effectuation_1

Constant error variance



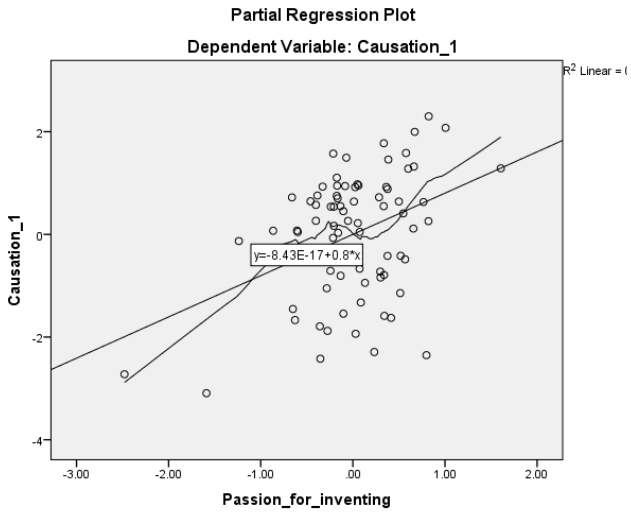
Normally distributed errors

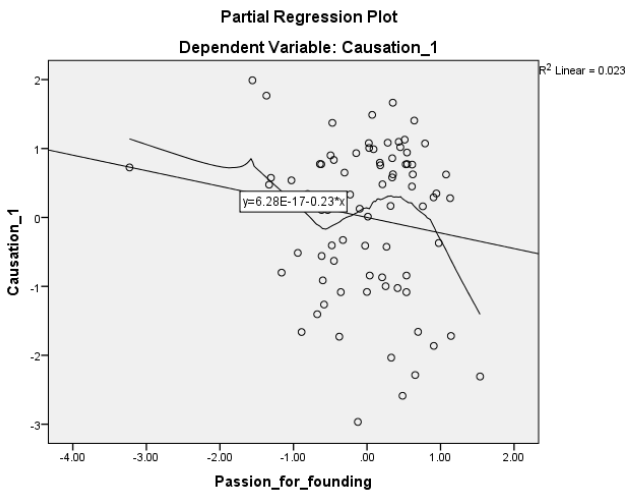




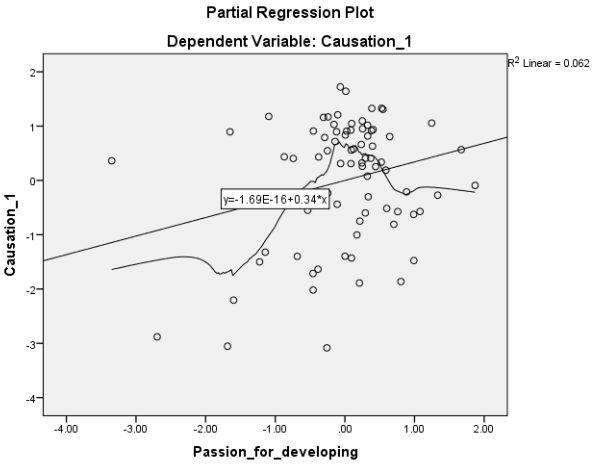
10.7.4 Hypothesis 2 – Causation

1. Linearity





2. Independence of errors



Model Summary[c]

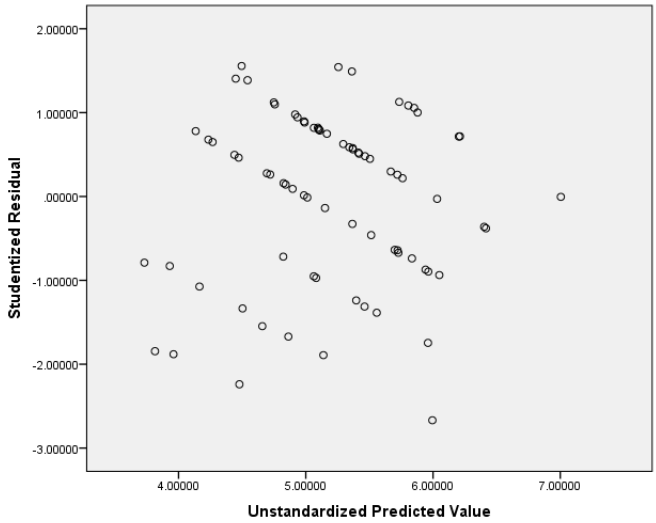
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.229[a]	.052	.001	1.290	
2	.510[b]	.260	.186	1.164	2.145

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

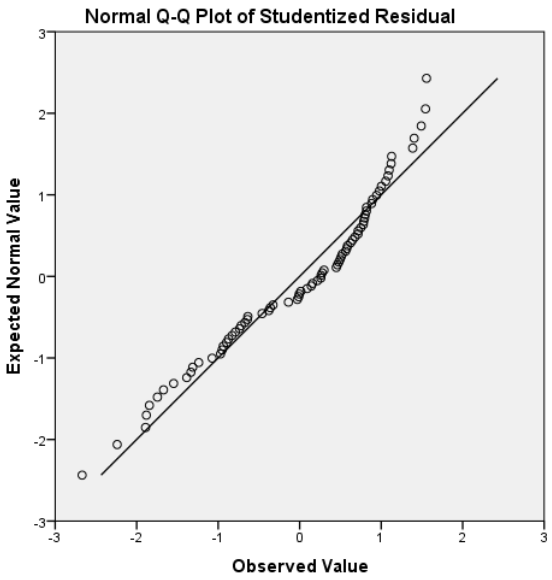
b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

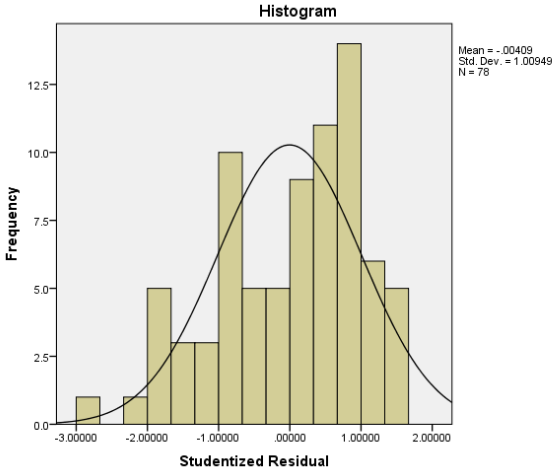
c. Dependent Variable: Causation_1

3. Constant error variance



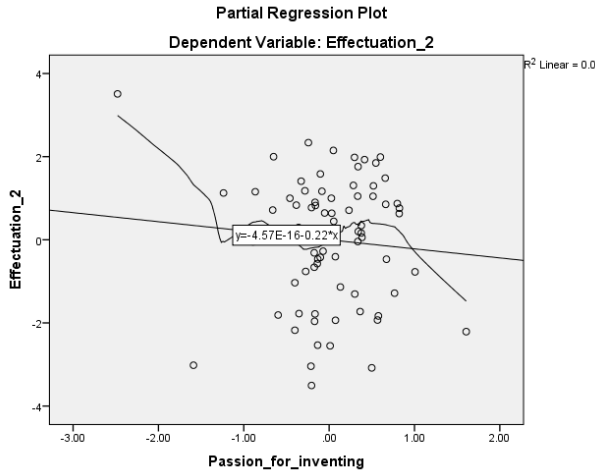
4. Normally distributed errors

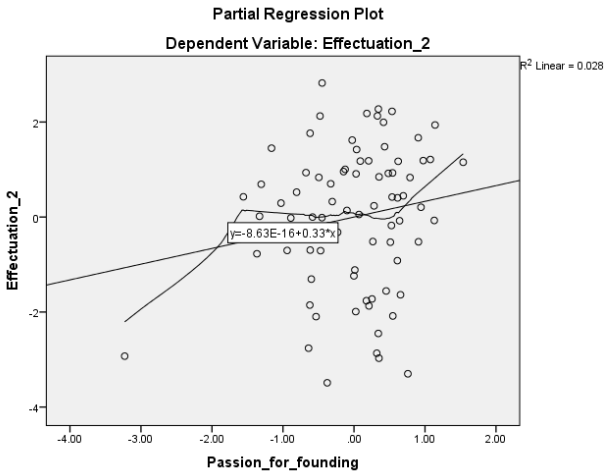


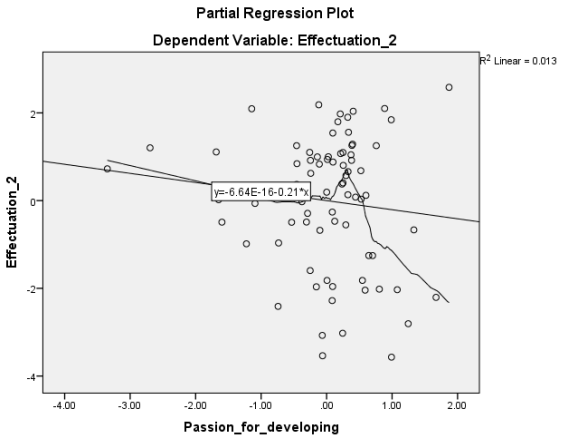


10.7.5 Hypothesis 3 – Effectuation

1. linearity







2. Independence of errors

Model Summary[c]

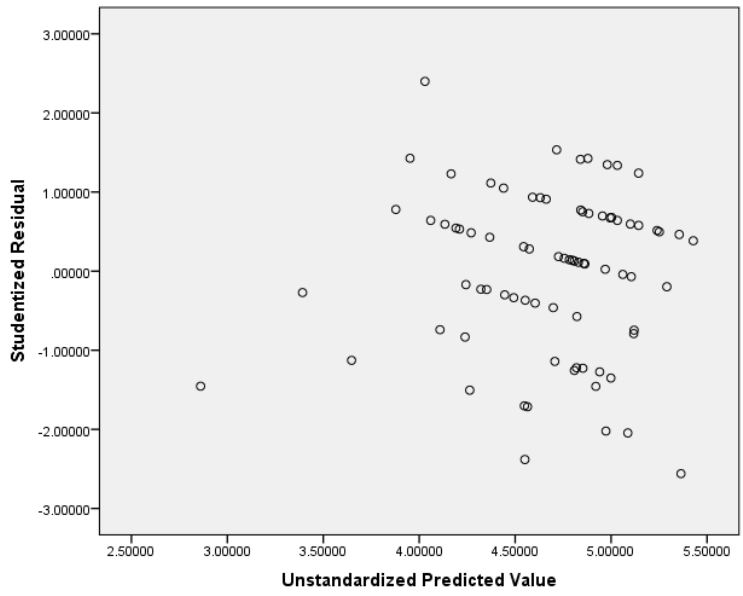
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.234[a]	.055	.003	1.549	
2	.295[b]	.087	-.004	1.555	1.669

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

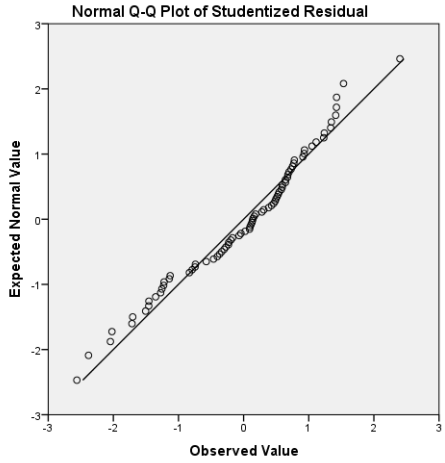
b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

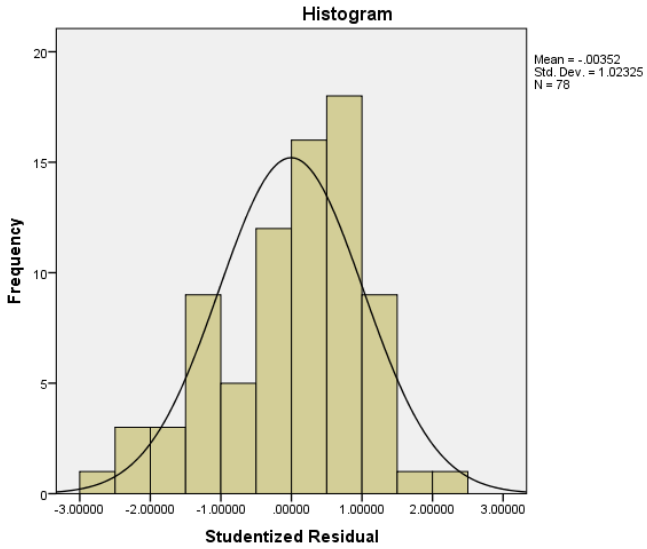
c. Dependent Variable: Effectuation_2

3. Constant error variance



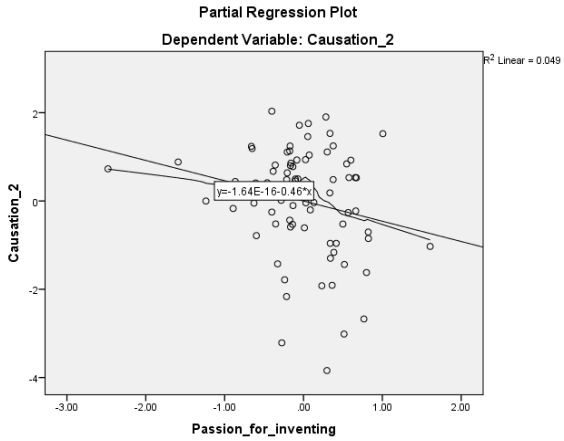
4. Normally distributed errors

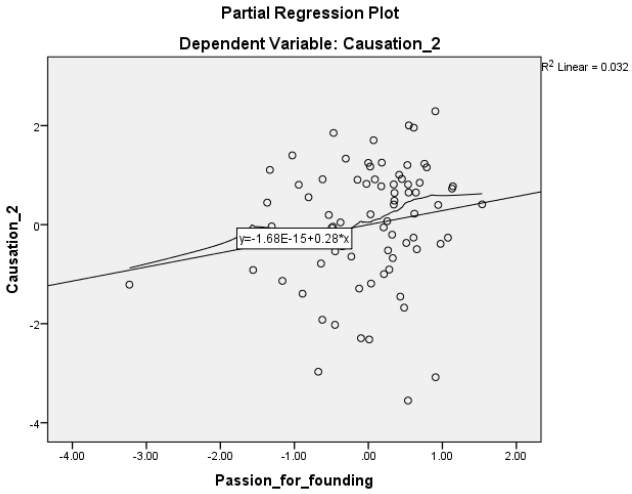


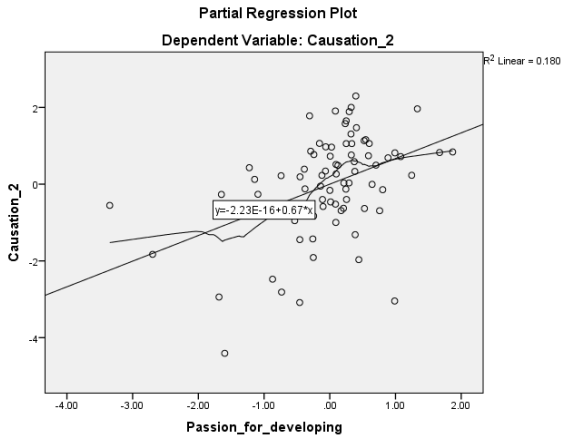


10.7.6 Hypothesis 3 – Causation

1. Linearity







2. Independence of errors

Model Summary[c]

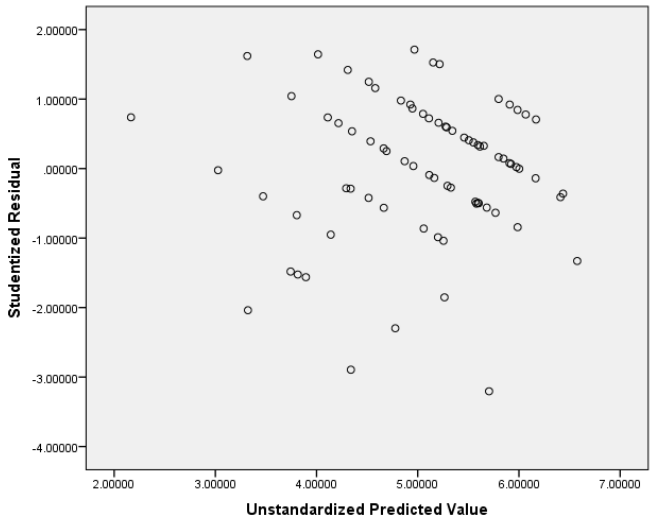
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.360[a]	.130	.082	1.415	
2	.589[b]	.347	.281	1.252	2.180

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

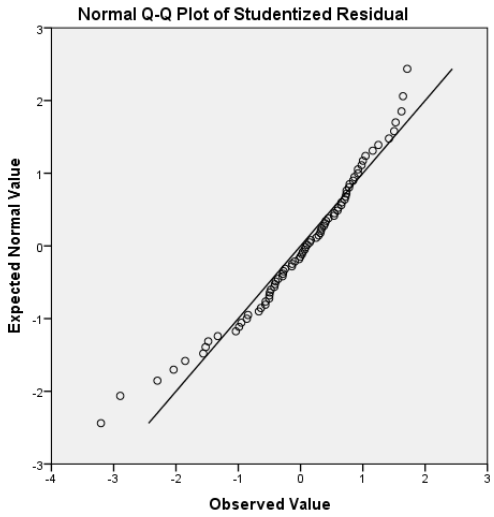
b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

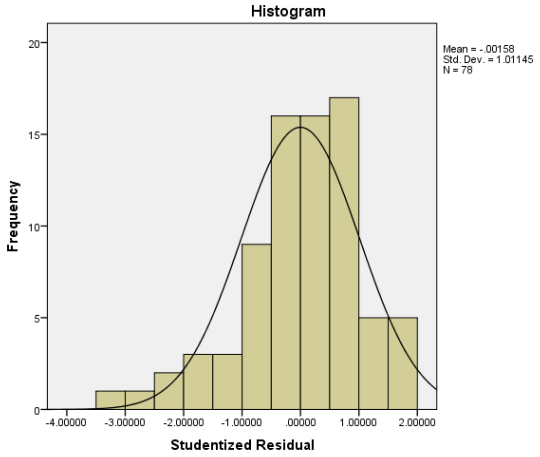
c. Dependent Variable: Causation_2

3. Constant error variance



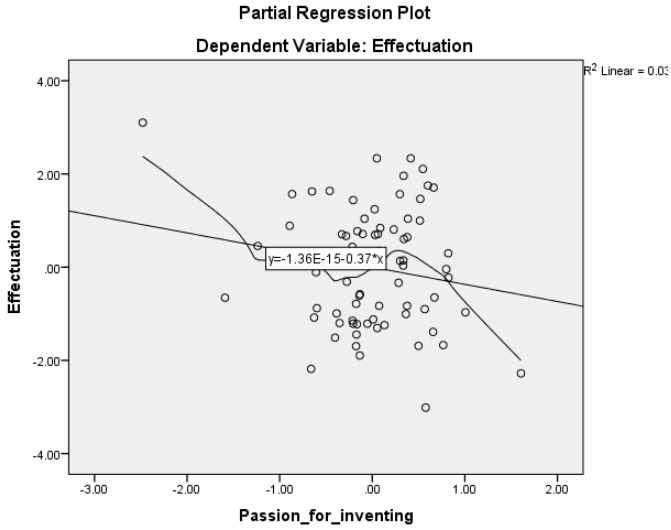
4. Normally distributed errors

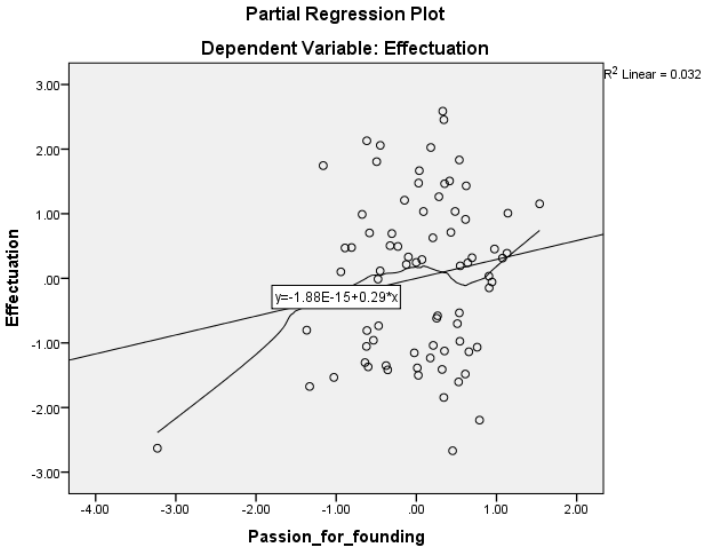


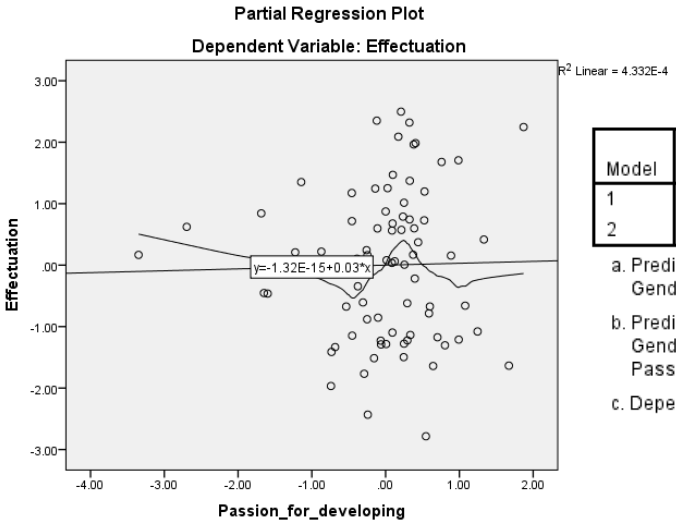


10.7.7. Hypothesis 4 – effectuation

1. Linearity







2. Independence of errors

Model Summary[c]

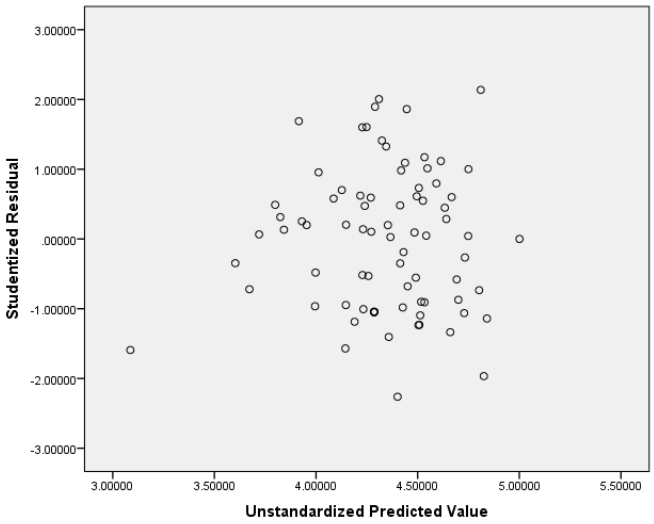
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.141[a]	.020	-.034	1.29109	
2	.257[b]	.066	-.027	1.28704	1.673

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

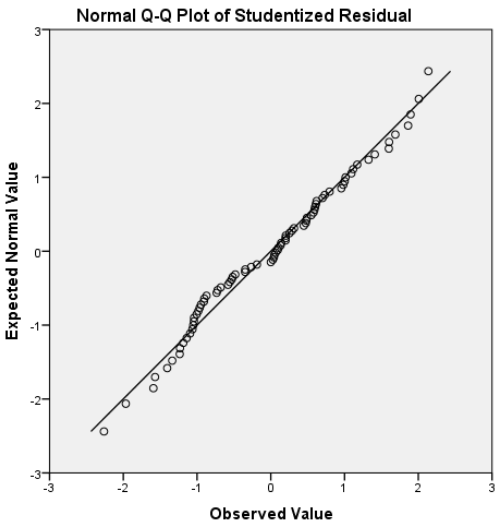
b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

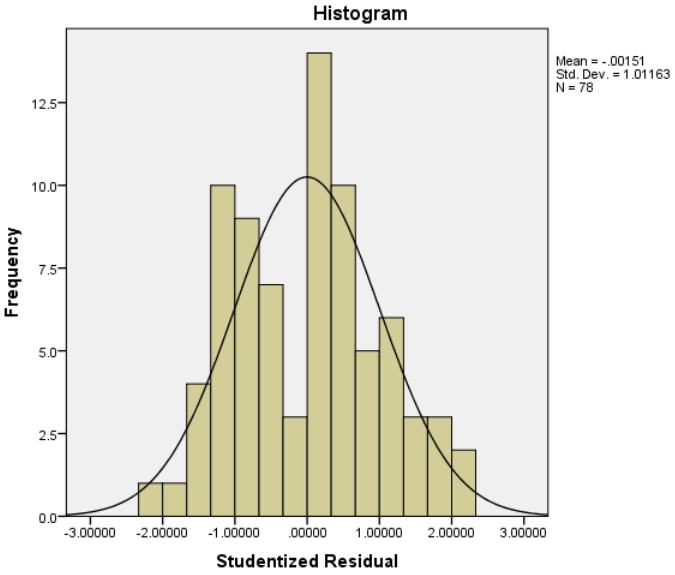
c. Dependent Variable: Effectuation

3. Constant error variance



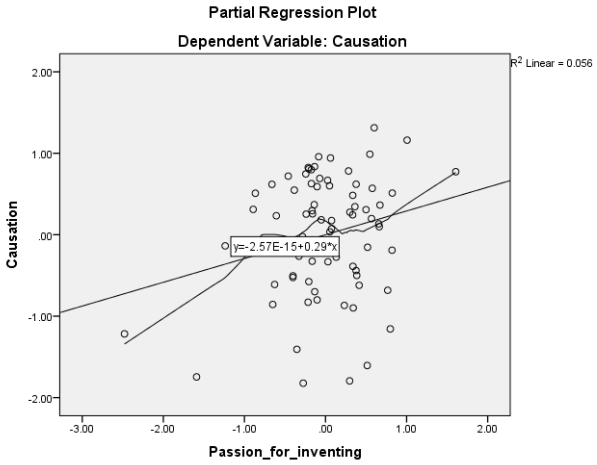
4. Normally distributed errors

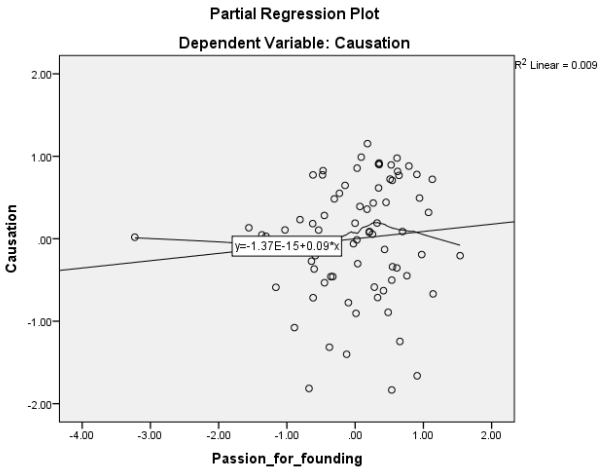


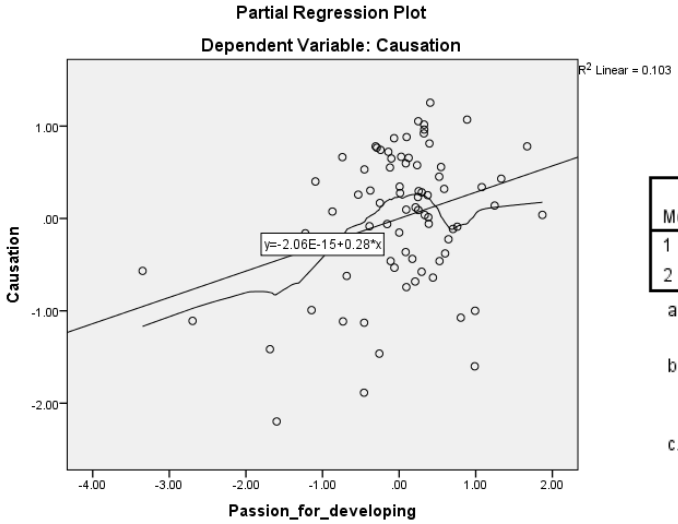


10.7.8 Hypothesis 4 – Causation

1. Linearity







2. Independence of errors

Model Summary[c]

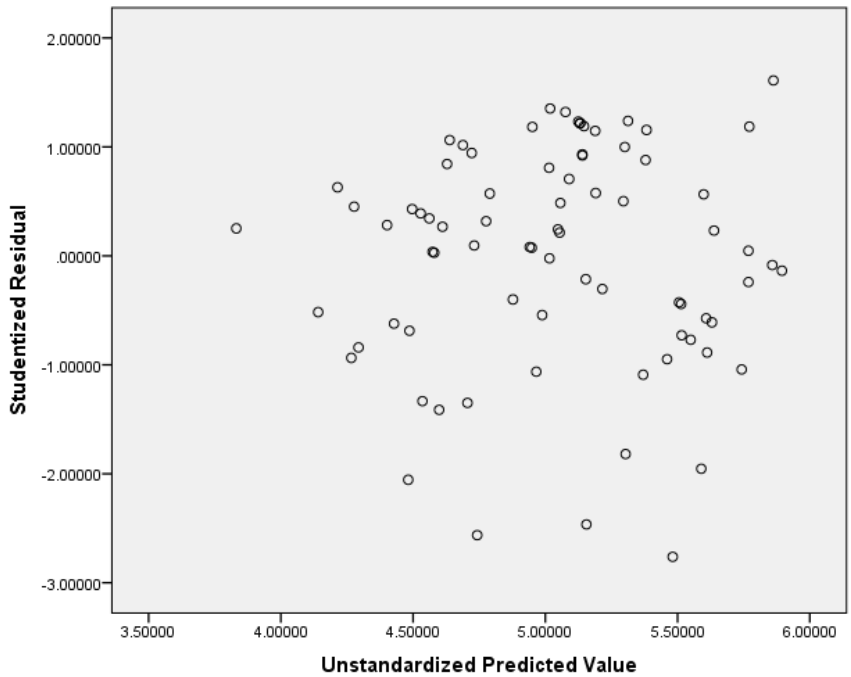
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.314[a]	.099	.049	.82631	
2	.558[b]	.311	.242	.73792	2.247

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

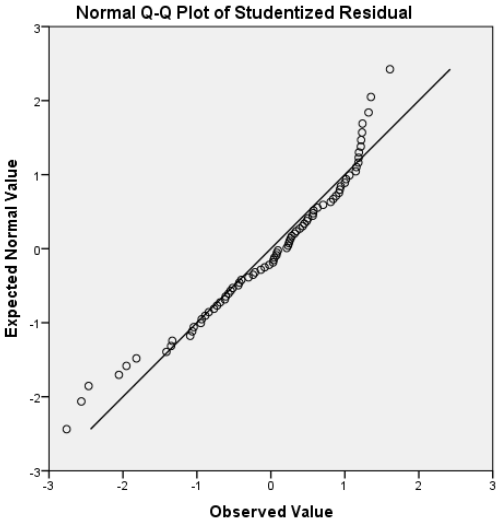
b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

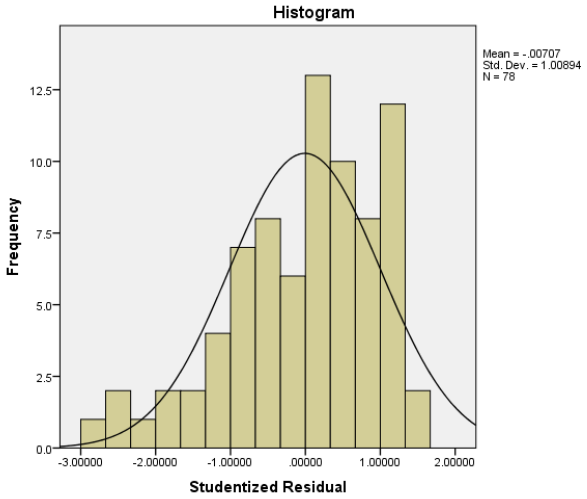
c. Dependent Variable: Causation

3. Constant error variance



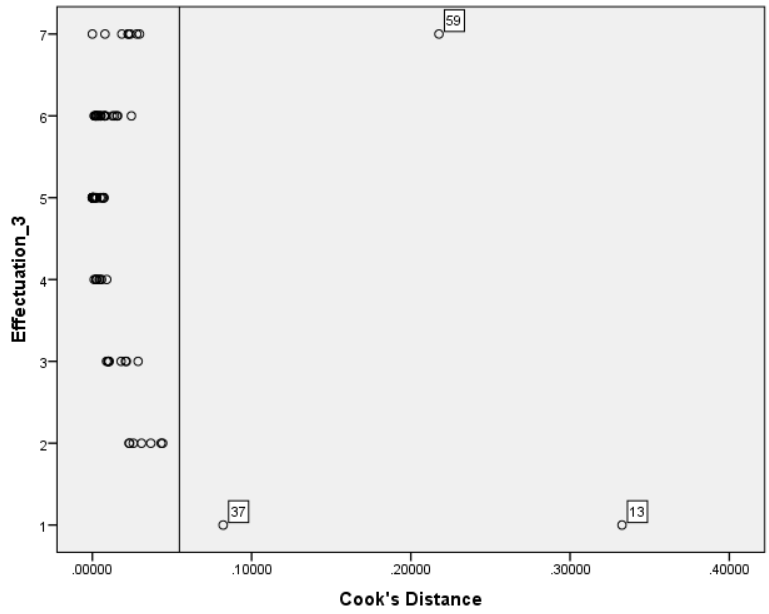
4. Normally distributed errors



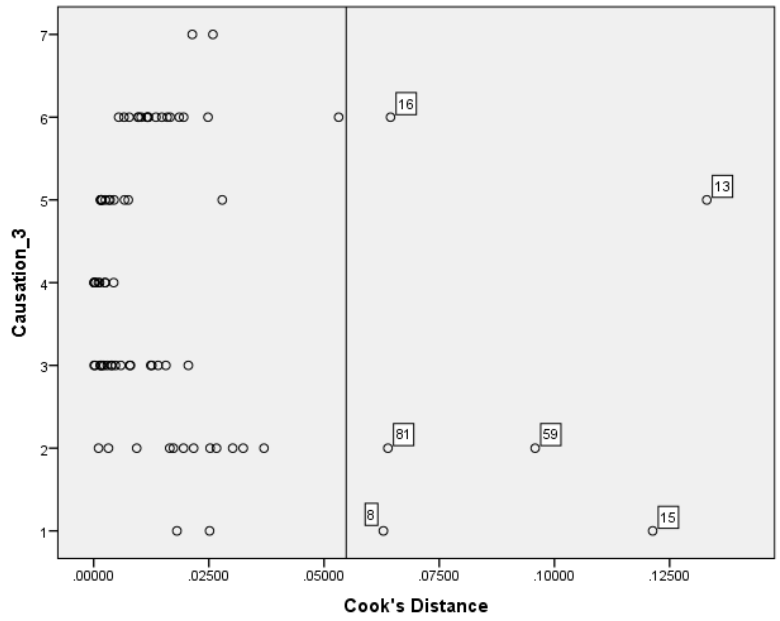


10.8 Influential cases

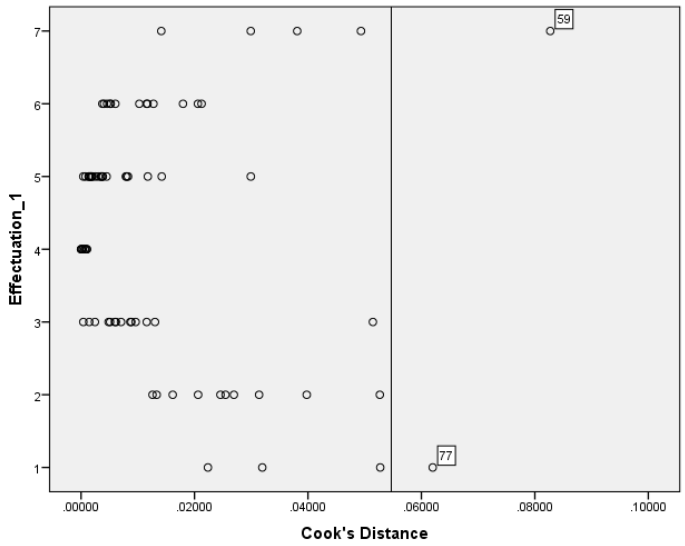
10.8.1 Hypothesis 1 effectuation



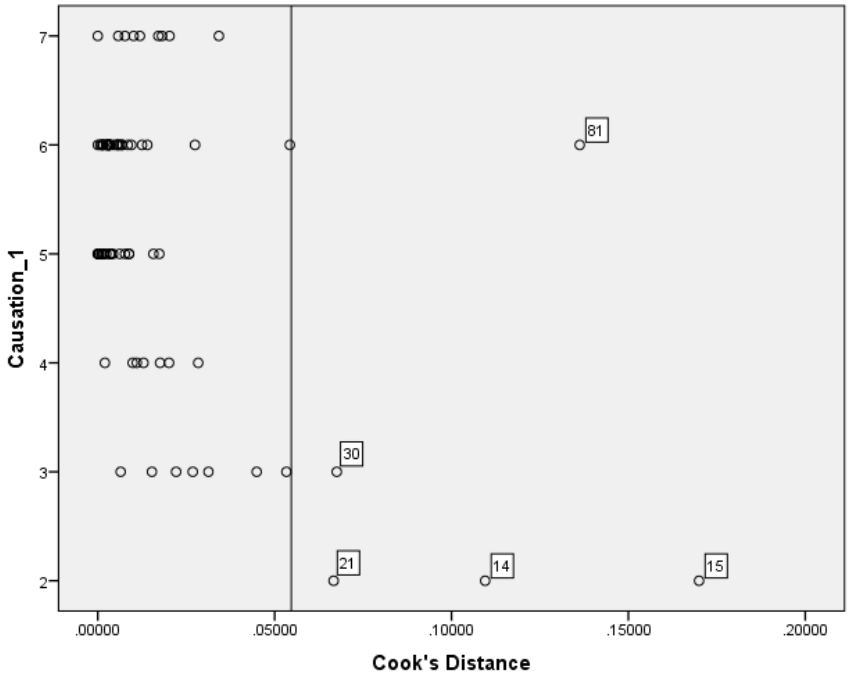
10.8.2 Hypothesis 1 Causation



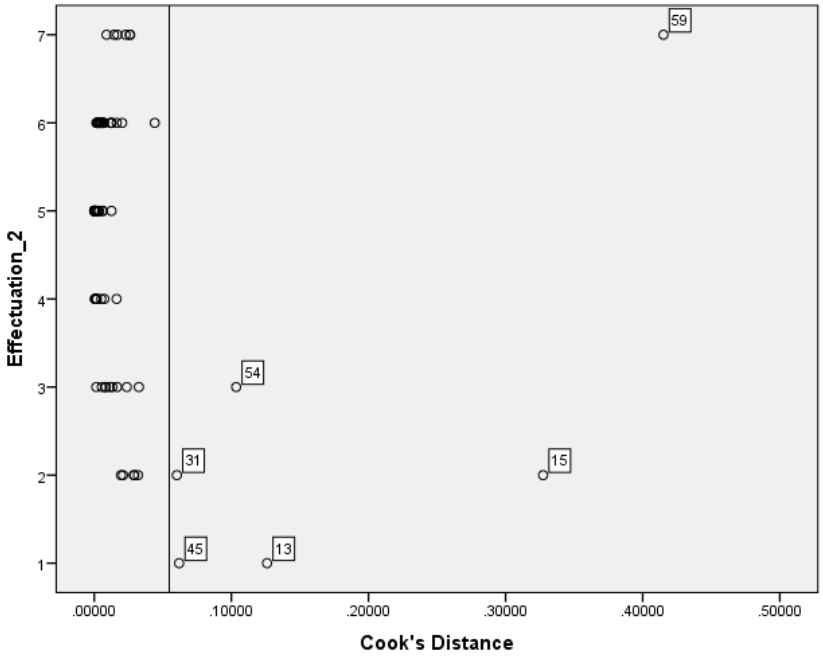
10.8.3 Hypothesis 2 – Effectuation



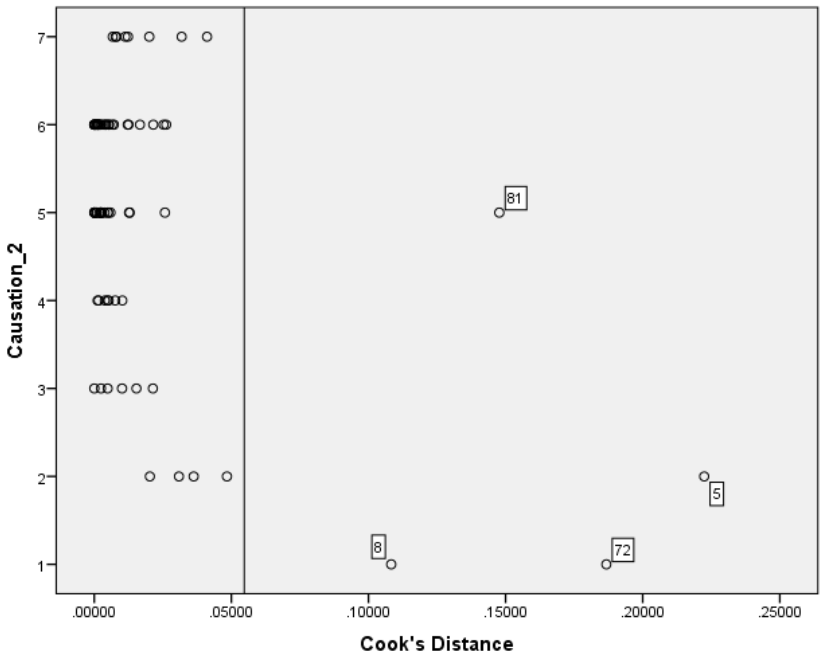
10.8.4 Hypothesis 2 – Causation



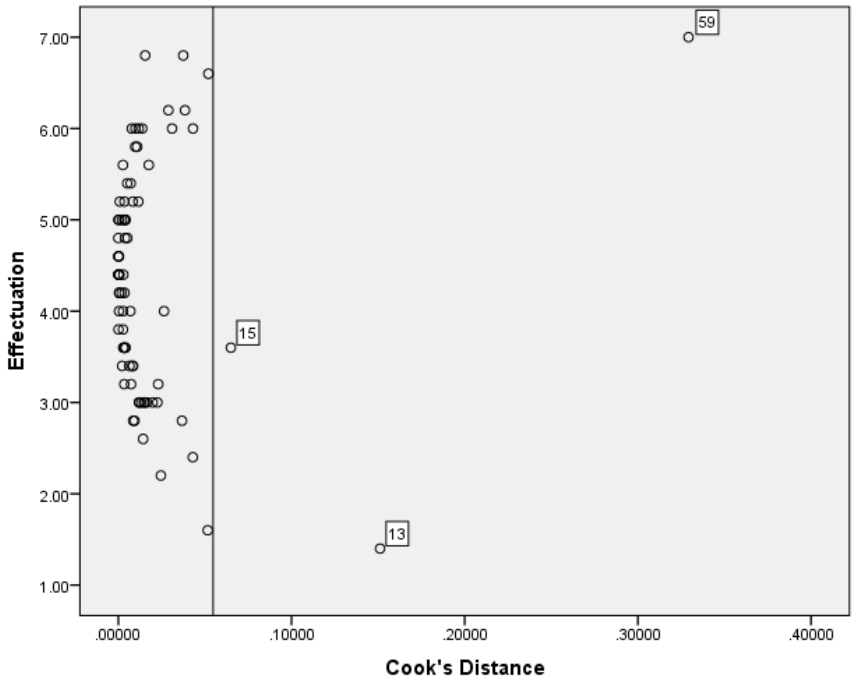
10.8.5 Hypothesis 3 – Effectuation



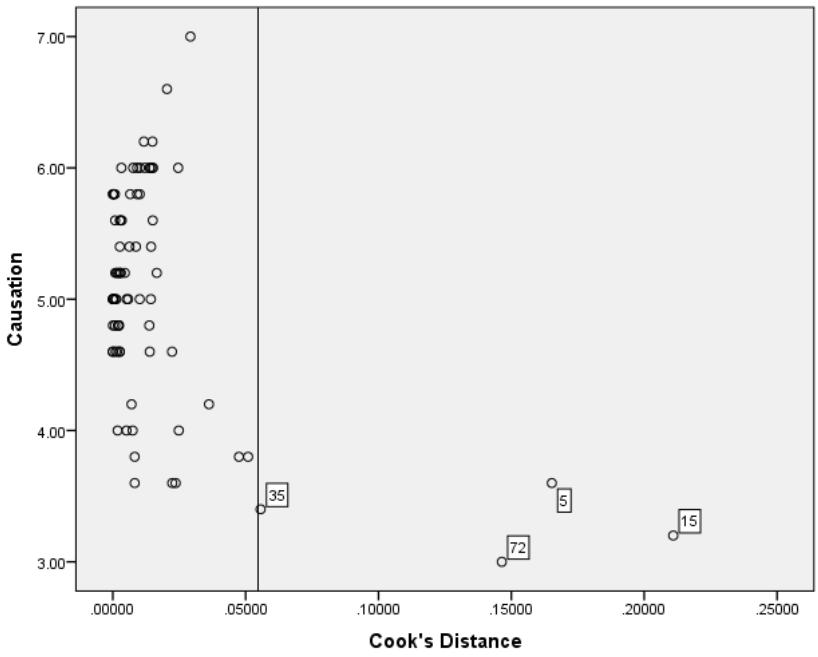
10.8.6 Hypothesis 3 – Causation



10.8.7 Hypothesis 4 – Effectuation

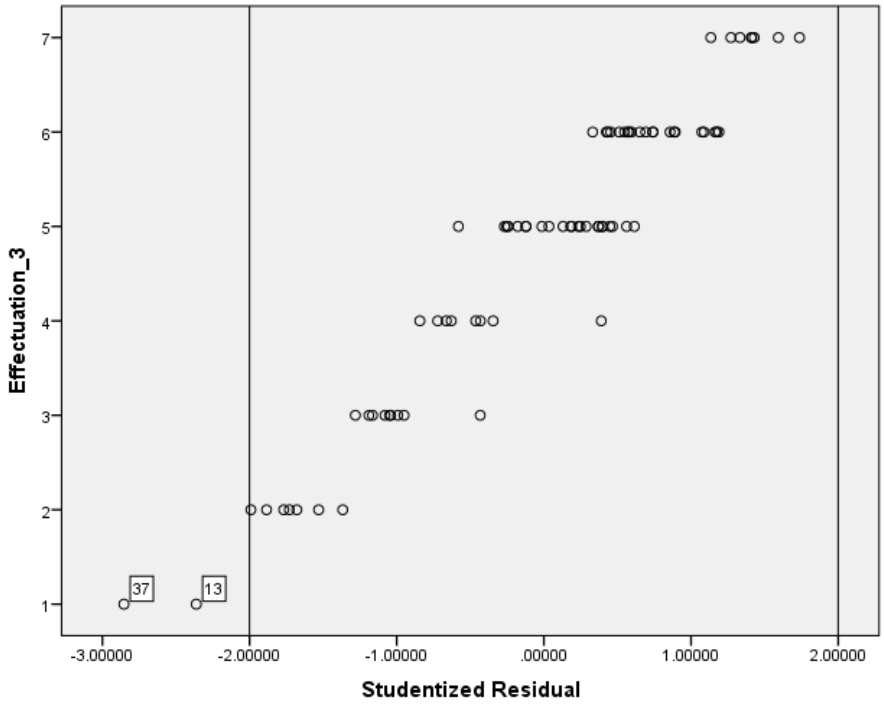


10.8.8 Hypothesis 4 – Causation

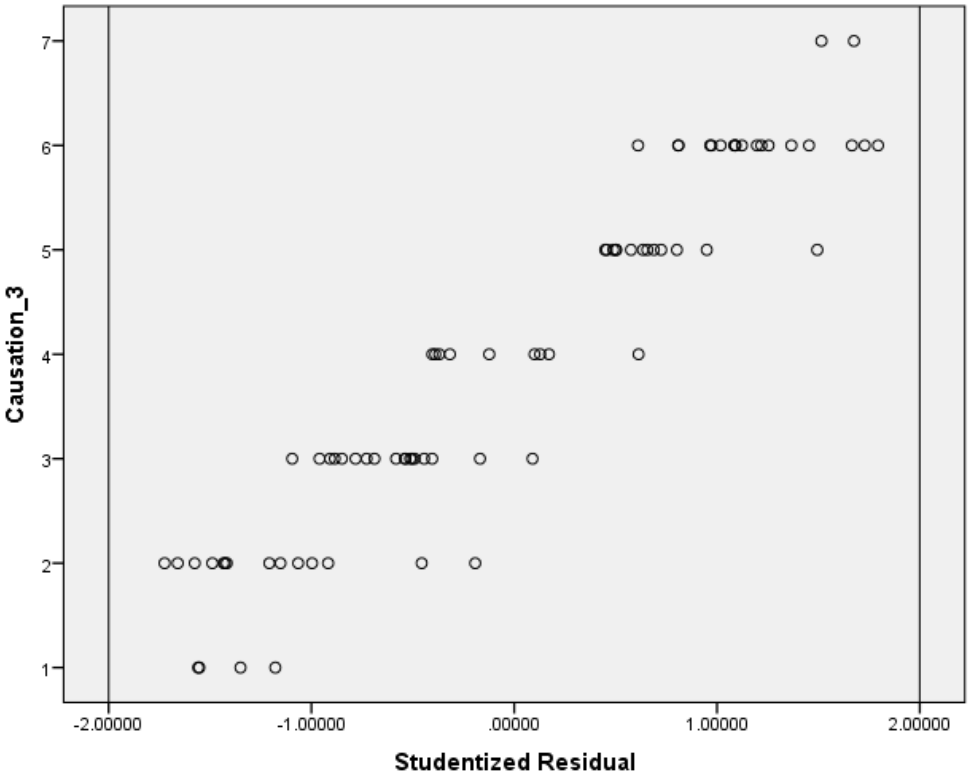


10.9 Outliers

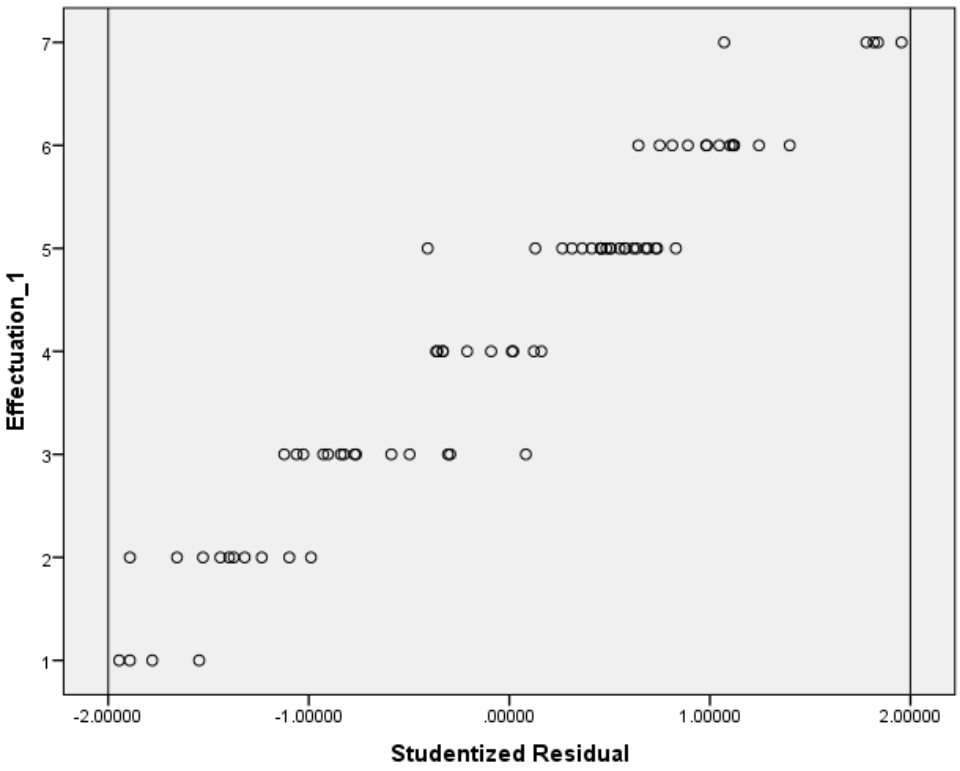
10.9.1 Hypothesis 1 – Effectuation



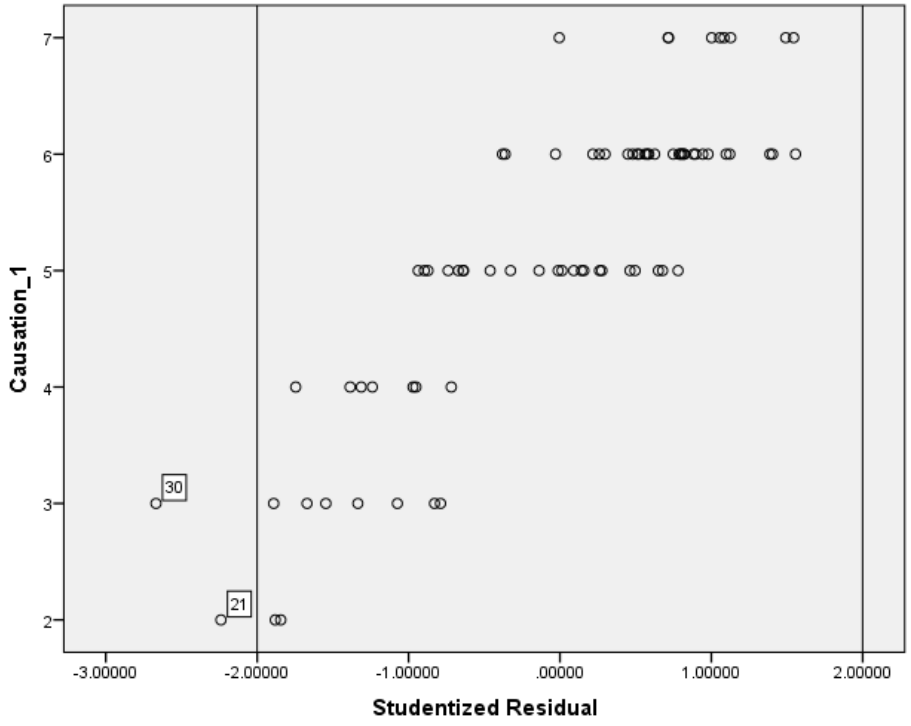
10.9.2 Hypothesis 1 - Causation



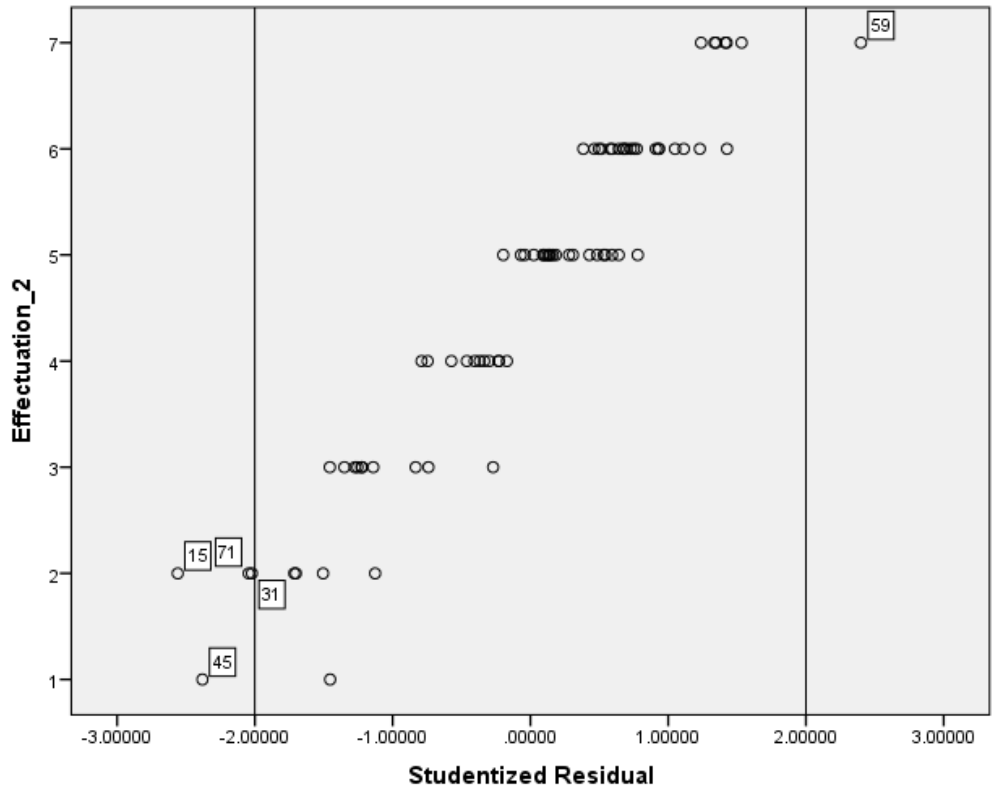
10.9.3 Hypothesis 2 - Effectuation



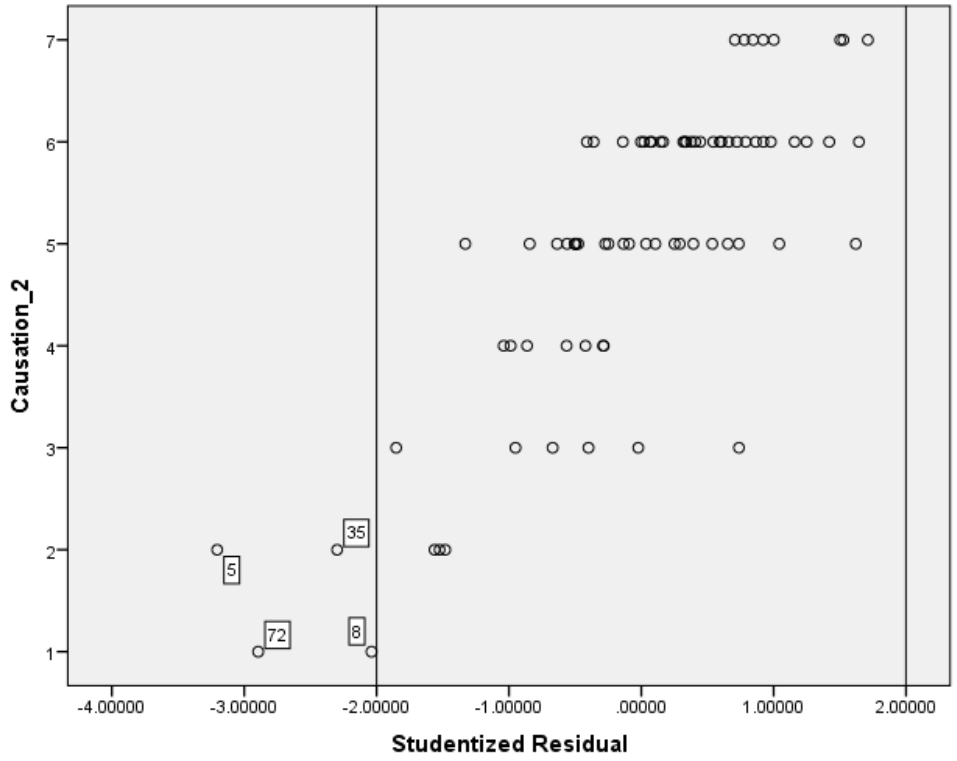
10.9.4 Hypothesis 2 – causation



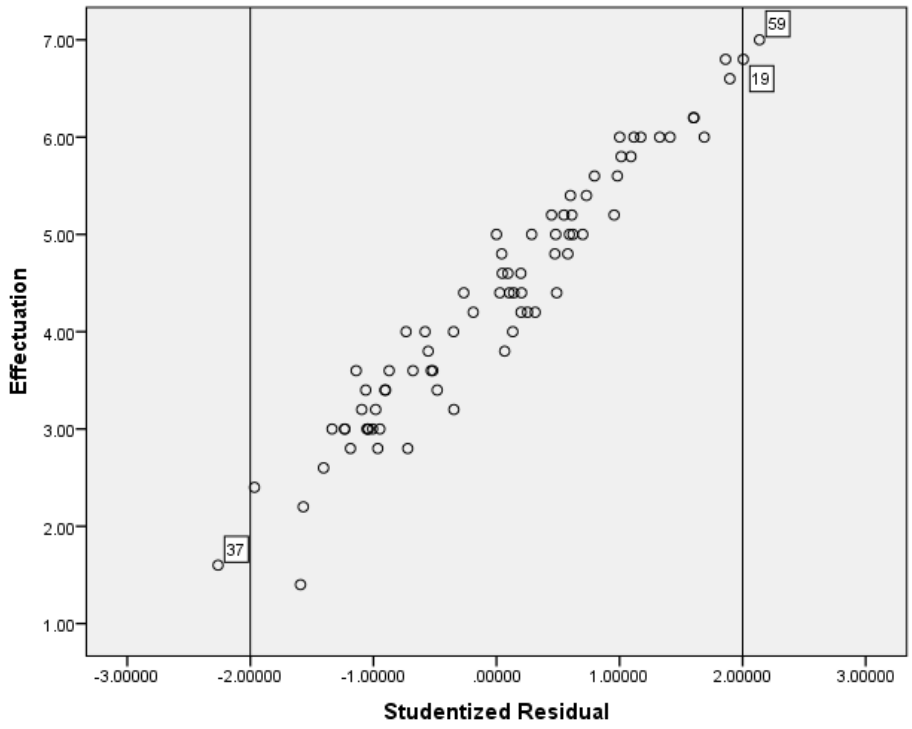
10.9.5 Hypothesis 3 – effectuation



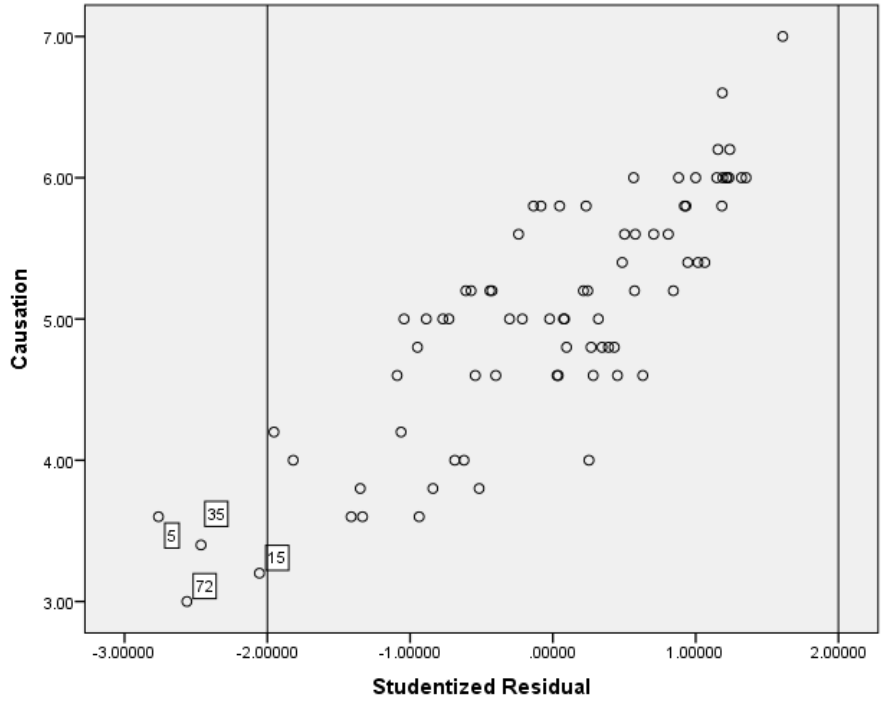
10.9.6 Hypothesis 3 - causation



10.9.7 Hypothesis 4 - Effectuation



10.9.8 Hypothesis 4 – causation



10.10 Initial hierarchical linear regression models – before assumptions checking

10.10.1 Hypothesis 1 – Effectuation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.152[a]	.023	-.031	1.586	.023	.429	4	73	.787
2	.280[b]	.078	-.014	1.573	.055	1.402	3	70	.249

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.317	4	1.079	.429	.787[b]
	Residual	183.529	73	2.514		
	Total	187.846	77			
2	Regression	14.721	7	2.103	.850	.550[c]
	Residual	173.125	70	2.473		
	Total	187.846	77			

a. Dependent Variable: Effectuation_3

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

c. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	4.055	.946		4.285	.000	2.169	5.942
	Gender	.188	.362	.061	.518	.606	-.534	.910
	Age	.024	.029	.100	.825	.412	-.033	.081
	Entrepreneurial courses	.179	.396	.054	.452	.652	-.610	.968
	Familiar with effectuation	-.265	.310	-.102	-.856	.395	-.882	.352
2	(Constant)	1.218	2.238		.544	.588	-3.246	5.682
	Gender	.062	.366	.020	.170	.865	-.669	.793
	Age	.029	.029	.124	1.008	.317	-.029	.087
	Entrepreneurial courses	.330	.402	.100	.821	.415	-.471	1.131
	Familiar with effectuation	-.126	.317	-.049	-.397	.693	-.758	.506
	Passion_for_inventing	-.108	.305	-.045	-.354	.725	-.716	.500
	Passion_for_founding	.299	.236	.177	1.269	.209	-.171	.770
	Passion_for_developing	.239	.214	.142	1.114	.269	-.189	.666

a. Dependent Variable: Effectuation_3

10.10.2 Hypothesis 1 - Causation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.204[a]	.042	-.011	1.672	.042	.792	4	73	.534
2	.330[b]	.109	.019	1.646	.067	1.755	3	70	.164

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.850	4	2.212	.792	.534[b]
	Residual	204.035	73	2.795		
	Total	212.885	77			
2	Regression	23.123	7	3.303	1.219	.304[c]
	Residual	189.762	70	2.711		
	Total	212.885	77			

a. Dependent Variable: Causation_3

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

c. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	4.786	.998		4.796	.000	2.797	6.775
	Gender	-.141	.382	-.043	-.369	.713	-.902	.620
	Age	-.001	.030	-.004	-.031	.975	-.061	.059
	Entrepreneurial courses	-.312	.417	-.089	-.747	.457	-1.144	.520
	Familiar with effectuation	-.435	.327	-.158	-1.333	.187	-1.086	.216
2	(Constant)	1.355	2.343		.578	.565	-3.319	6.029
	Gender	-.291	.384	-.089	-.759	.450	-1.056	.474
	Age	.001	.031	.003	.026	.980	-.060	.062
	Entrepreneurial courses	-.112	.421	-.032	-.266	.791	-.950	.727
	Familiar with effectuation	-.264	.332	-.096	-.795	.429	-.926	.398
	Passion_for_inventing	-.023	.319	-.009	-.071	.943	-.659	.614
	Passion_for_founding	.448	.247	.249	1.813	.074	-.045	.940
	Passion_for_developing	.117	.224	.065	.521	.604	-.330	.564

a. Dependent Variable: Causation_3

10.10.3 Hypothesis 2 Effectuation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.117[a]	.014	-.040	1.665	.014	.254	4	73	.907
2	.263[b]	.069	-.024	1.652	.056	1.394	3	70	.252

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.814	4	.704	.254	.907[b]
	Residual	202.481	73	2.774		
	Total	205.295	77			
2	Regression	14.230	7	2.033	.745	.635[c]
	Residual	191.065	70	2.729		
	Total	205.295	77			

a. Dependent Variable: Effectuation_1

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

c. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	4.086	.994		4.110	.000	2.104	6.067
	Gender	.194	.381	.060	.510	.611	-.564	.953
	Age	.011	.030	.044	.364	.717	-.049	.071
	Entrepreneurial courses	-.343	.416	-.100	-.826	.412	-1.172	.485
	Familiar with effectuation	-.115	.325	-.042	-.354	.725	-.763	.533
2	(Constant)	6.223	2.351		2.646	.010	1.533	10.913
	Gender	.102	.385	.032	.264	.792	-.666	.870
	Age	.012	.031	.050	.406	.686	-.049	.073
	Entrepreneurial courses	-.312	.422	-.091	-.739	.463	-1.153	.530
	Familiar with effectuation	-.030	.333	-.011	-.090	.929	-.694	.634
	Passion_for_inventing	-.649	.320	-.258	-2.027	.046	-1.288	-.011
	Passion_for_founding	.211	.248	.119	.851	.398	-.283	.705
	Passion_for_developing	.081	.225	.046	.359	.721	-.368	.530

a. Dependent Variable: Effectuation_1

10.10.4 Hypothesis 2 - Causation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.229[a]	.052	.001	1.290	.052	1.011	4	73	.408
2	.510[b]	.260	.186	1.164	.207	6.536	3	70	.001

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.722	4	1.681	1.011	.408[b]
	Residual	121.393	73	1.663		
	Total	128.115	77			
2	Regression	33.287	7	4.755	3.510	.003[c]
	Residual	94.829	70	1.355		
	Total	128.115	77			

a. Dependent Variable: Causation_1

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

c. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	6.043	.770		7.851	.000	4.509	7.577
	Gender	-.343	.295	-.135	-1.165	.248	-.931	.244
	Age	-.007	.023	-.037	-.307	.760	-.054	.039
	Entrepreneurial courses	-.386	.322	-.142	-1.199	.234	-1.028	.256
	Familiar with effectuation	-.106	.252	-.050	-.421	.675	-.608	.396
2	(Constant)	.116	1.657		.070	.944	-3.188	3.420
	Gender	-.301	.271	-.118	-1.109	.271	-.842	.240
	Age	.003	.022	.018	.160	.873	-.040	.046
	Entrepreneurial courses	-.338	.297	-.124	-1.137	.259	-.931	.255
	Familiar with effectuation	-.131	.235	-.061	-.560	.577	-.599	.336
	Passion_for_inventing	.804	.226	.405	3.563	.001	.354	1.254
	Passion_for_founding	-.226	.175	-.162	-1.294	.200	-.574	.122
	Passion_for_developing	.342	.159	.247	2.154	.035	.025	.658

a. Dependent Variable: Causation_1

10.10.5 Hypothesis 3 - Effectuation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.234[a]	.055	.003	1.549	.055	1.055	4	73	.385
2	.295[b]	.087	-.004	1.555	.032	.829	3	70	.482

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.132	4	2.533	1.055	.385[b]
	Residual	175.202	73	2.400		
	Total	185.333	77			
2	Regression	16.144	7	2.306	.954	.471[c]
	Residual	169.189	70	2.417		
	Total	185.333	77			

a. Dependent Variable: Effectuation_2

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

c. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	4.254	.925		4.600	.000	2.411	6.097
	Gender	.663	.354	.217	1.872	.065	-.043	1.368
	Age	.013	.028	.054	.455	.650	-.043	.069
	Entrepreneurial courses	-.273	.387	-.084	-.707	.482	-1.044	.497
	Familiar with effectuation	-.258	.303	-.100	-.853	.396	-.861	.345
2	(Constant)	4.994	2.213		2.257	.027	.580	9.407
	Gender	.587	.362	.192	1.620	.110	-.136	1.310
	Age	.006	.029	.024	.196	.845	-.052	.063
	Entrepreneurial courses	-.195	.397	-.060	-.492	.625	-.987	.597
	Familiar with effectuation	-.177	.313	-.069	-.564	.574	-.802	.448
	Passion_for_inventing	-.218	.301	-.091	-.723	.472	-.819	.383
	Passion_for_founding	.331	.233	.197	1.417	.161	-.135	.796
	Passion_for_developing	-.207	.212	-.124	-.978	.332	-.629	.215

a. Dependent Variable: Effectuation_2

10.10.6 Hypothesis 3 - Causation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.360[a]	.130	.082	1.415	.130	2.725	4	73	.036
2	.589[b]	.347	.281	1.252	.217	7.734	3	70	.000

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.819	4	5.455	2.725	.036[b]
	Residual	146.130	73	2.002		
	Total	167.949	77			
2	Regression	58.197	7	8.314	5.303	.000[c]
	Residual	109.752	70	1.568		
	Total	167.949	77			

a. Dependent Variable: Causation_2

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

c. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	5.354	.845		6.339	.000	3.671	7.037
	Gender	-.113	.323	-.039	-.350	.727	-.757	.531
	Age	.026	.026	.118	1.030	.306	-.025	.077
	Entrepreneurial courses	-.949	.353	-.305	-2.688	.009	-1.653	-.245
	Familiar with effectuation	-.408	.276	-.167	-1.478	.144	-.959	.142
2	(Constant)	1.789	1.782		1.004	.319	-1.765	5.344
	Gender	-.304	.292	-.104	-1.041	.301	-.886	.278
	Age	.044	.023	.198	1.909	.060	-.002	.091
	Entrepreneurial courses	-.771	.320	-.248	-2.410	.019	-1.409	-.133
	Familiar with effectuation	-.208	.252	-.085	-.823	.414	-.711	.296
	Passion_for_inventing	-.459	.243	-.202	-1.892	.063	-.943	.025
	Passion_for_founding	.285	.188	.178	1.515	.134	-.090	.659
	Passion_for_developing	.669	.171	.422	3.919	.000	.328	1.009

a. Dependent Variable: Causation_2

10.10.7 Hypothesis 4 - Effectuation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.141[a]	.020	-.034	1.29109	.020	.370	4	73	.829
2	.257[b]	.066	-.027	1.28704	.046	1.153	3	70	.334

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.468	4	.617	.370	.829[b]
	Residual	121.684	73	1.667		
	Total	124.152	77			
2	Regression	8.199	7	1.171	.707	.666[c]
	Residual	115.953	70	1.656		
	Total	124.152	77			

a. Dependent Variable: Effectuation

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

c. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	3.786	.771		4.913	.000	2.250	5.322
	Gender	.272	.295	.109	.922	.360	-.316	.860
	Age	.016	.023	.085	.702	.485	-.030	.063
	Entrepreneurial courses	.023	.322	.009	.071	.943	-.619	.665
	Familiar with effectuation	-.158	.252	-.075	-.627	.533	-.661	.345
2	(Constant)	4.040	1.832		2.205	.031	.386	7.693
	Gender	.170	.300	.068	.568	.572	-.428	.769
	Age	.016	.024	.084	.678	.500	-.031	.064
	Entrepreneurial courses	.109	.329	.041	.332	.741	-.547	.765
	Familiar with effectuation	-.053	.259	-.025	-.204	.839	-.570	.464
	Passion_for_inventing	-.368	.249	-.188	-1.476	.144	-.866	.129
	Passion_for_founding	.292	.193	.212	1.514	.135	-.093	.677
	Passion_for_developing	.031	.175	.022	.174	.862	-.319	.380

a. Dependent Variable: Effectuation

10.10.8 Hypothesis 4 - Causation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.314[a]	.099	.049	.82631	.099	2.001	4	73	.103
2	.558[b]	.311	.242	.73792	.212	7.179	3	70	.000

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.465	4	1.366	2.001	.103[b]
	Residual	49.844	73	.683		
	Total	55.309	77			
2	Regression	17.192	7	2.456	4.510	.000[c]
	Residual	38.117	70	.545		
	Total	55.309	77			

a. Dependent Variable: Causation

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

c. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	5.581	.493		11.315	.000	4.598	6.564
	Gender	-.046	.189	-.027	-.242	.810	-.422	.331
	Age	.002	.015	.012	.106	.916	-.028	.031
	Entrepreneurial courses	-.415	.206	-.232	-2.012	.048	-.826	-.004
	Familiar with effectuation	-.252	.161	-.179	-1.562	.123	-.574	.070
2	(Constant)	1.263	1.050		1.202	.233	-.832	3.357
	Gender	-.103	.172	-.062	-.601	.550	-.446	.240
	Age	.009	.014	.073	.687	.494	-.018	.037
	Entrepreneurial courses	-.301	.188	-.169	-1.598	.115	-.677	.075
	Familiar with effectuation	-.178	.149	-.127	-1.198	.235	-.475	.119
	Passion_for_inventing	.292	.143	.224	2.040	.045	.007	.577
	Passion_for_founding	.089	.111	.097	.800	.426	-.132	.309
	Passion_for_developing	.285	.101	.313	2.832	.006	.084	.485

a. Dependent Variable: Causation

10.11 Hypothesis testing after assumptions checking and removal of influential cases

10.11.1 Hypothesis 1 - effectuation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.174[a]	.030	-.025	1.461	.030	.549	4	70	.700
2	.398[b]	.159	.071	1.391	.128	3.402	3	67	.023

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.690	4	1.172	.549	.700[b]
	Residual	149.390	70	2.134		
	Total	154.080	74			
2	Regression	24.437	7	3.491	1.804	.101[c]
	Residual	129.643	67	1.935		
	Total	154.080	74			

a. Dependent Variable: Effectuation_3

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

c. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	4.358	.881		4.946	.000		
	Gender	.171	.345	.060	.496	.621	.962	1.039
	Age	.014	.027	.067	.544	.588	.909	1.100
	Entrepreneurial courses	.324	.371	.107	.873	.386	.914	1.094
	Familiar with effectuation	-.284	.285	-.121	-.995	.323	.938	1.066
2	(Constant)	-1.883	2.158		-.873	.386		
	Gender	.175	.335	.061	.522	.603	.923	1.083
	Age	.021	.026	.099	.825	.412	.871	1.149
	Entrepreneurial courses	.466	.360	.155	1.297	.199	.881	1.135
	Familiar with effectuation	-.222	.282	-.095	-.787	.434	.869	1.150
	Passion_for_inventing	.620	.333	.237	1.864	.067	.778	1.285
	Passion_for_founding	.057	.243	.033	.235	.815	.620	1.613
	Passion_for_developing	.301	.207	.194	1.459	.149	.712	1.405

a. Dependent Variable: Effectuation_3

10.11.2 Hypothesis 1 - causation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.206[a]	.043	-.015	1.612	.043	.744	4	67	.565
2	.365[b]	.133	.038	1.569	.091	2.231	3	64	.093

a. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age

b. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.735	4	1.934	.744	.565[b]
	Residual	174.043	67	2.598		
	Total	181.778	71			
2	Regression	24.214	7	3.459	1.405	.219[c]
	Residual	157.564	64	2.462		
	Total	181.778	71			

a. Dependent Variable: Causation_3

b. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age

c. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	4.823	.972		4.960	.000		
	Gender	.240	.428	.068	.560	.577	.983	1.017
	Age	-.010	.030	-.040	-.318	.752	.883	1.132
	Entrepreneurial courses	-.392	.433	-.115	-.906	.368	.886	1.129
	Familiar with effectuation	-.337	.331	-.126	-1.020	.311	.931	1.074
2	(Constant)	3.229	2.648		1.219	.227		
	Gender	.145	.420	.041	.346	.731	.966	1.035
	Age	-.011	.030	-.048	-.381	.704	.854	1.171
	Entrepreneurial courses	-.191	.441	-.056	-.433	.666	.810	1.235
	Familiar with effectuation	-.113	.336	-.042	-.336	.738	.855	1.169
	Passion_for_inventing	-.433	.436	-.136	-.994	.324	.721	1.386
	Passion_for_founding	.660	.275	.349	2.399	.019	.640	1.563
	Passion_for_developing	.013	.276	.007	.046	.964	.653	1.530

a. Dependent Variable: Causation_3

10.11.3 Hypothesis 2 – effectuation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.188[a]	.035	-.019	1.595	.035	.652	4	71	.627
2	.234[b]	.055	-.042	1.613	.020	.468	3	68	.706

a. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.637	4	1.659	.652	.627[b]
	Residual	180.560	71	2.543		
	Total	187.197	75			
2	Regression	10.291	7	1.470	.565	.782[c]
	Residual	176.907	68	2.602		
	Total	187.197	75			

a. Dependent Variable: Effectuation_1

b. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age

c. Predictors: (Constant), Familiar with effectuation, Entrepreneurial courses, Gender, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.836	.956		4.014	.000		
	Gender	.198	.374	.063	.531	.597	.973	1.028
	Age	.024	.029	.101	.822	.414	.902	1.108
	Entrepreneurial courses	-.589	.407	-.176	-1.446	.153	.914	1.094
	Familiar with effectuation	-.117	.311	-.045	-.377	.708	.938	1.066
2	(Constant)	4.354	2.498		1.743	.086		
	Gender	.097	.389	.031	.249	.804	.919	1.089
	Age	.023	.030	.096	.755	.453	.856	1.168
	Entrepreneurial courses	-.503	.420	-.151	-1.197	.236	.879	1.138
	Familiar with effectuation	-.035	.325	-.013	-.107	.915	.881	1.134
	Passion_for_inventing	-.333	.369	-.117	-.902	.370	.820	1.220
	Passion_for_founding	.234	.243	.134	.963	.339	.714	1.400
	Passion_for_developing	.017	.231	.010	.076	.940	.743	1.347

a. Dependent Variable: Effectuation_1

10.11.4 Hypothesis 2 – Causation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.244[a]	.060	.004	1.118	.060	1.079	4	68	.374
2	.513[b]	.263	.184	1.013	.203	5.980	3	65	.001

a. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age

b. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.400	4	1.350	1.079	.374[b]
	Residual	85.039	68	1.251		
	Total	90.438	72			
2	Regression	23.794	7	3.399	3.315	.004[c]
	Residual	66.644	65	1.025		
	Total	90.438	72			

a. Dependent Variable: Causation_1

b. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age

c. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	5.714	.675		8.459	.000		
	Gender	.036	.272	.016	.134	.894	.976	1.024
	Age	-.002	.021	-.011	-.086	.932	.912	1.097
	Entrepreneurial courses	-.589	.295	-.246	-1.999	.050	.913	1.095
	Familiar with effectuation	.058	.225	.031	.256	.798	.942	1.061
2	(Constant)	.364	1.538		.237	.814		
	Gender	.005	.251	.002	.020	.984	.940	1.064
	Age	.003	.019	.018	.158	.875	.895	1.117
	Entrepreneurial courses	-.455	.277	-.190	-1.641	.106	.848	1.180
	Familiar with effectuation	-.013	.211	-.007	-.062	.951	.875	1.143
	Passion_for_inventing	.771	.213	.429	3.611	.001	.802	1.247
	Passion_for_founding	-.136	.159	-.114	-.857	.394	.642	1.558
	Passion_for_developing	.222	.187	.148	1.187	.240	.725	1.380

a. Dependent Variable: Causation_1

10.11.5 Hypothesis 3 - effectuation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.351[a]	.123	.071	1.324	.123	2.358	4	67	.062
2	.378[b]	.143	.049	1.340	.019	.484	3	64	.695

a. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age

b. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.539	4	4.135	2.358	.062[b]
	Residual	117.461	67	1.753		
	Total	134.000	71			
2	Regression	19.144	7	2.735	1.524	.175[c]
	Residual	114.856	64	1.795		
	Total	134.000	71			

a. Dependent Variable: Effectuation_2

b. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age

c. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	4.143	.912		4.544	.000		
	Gender	.906	.334	.317	2.712	.008	.956	1.046
	Age	.022	.028	.096	.802	.425	.905	1.105
	Entrepreneurial courses	-.492	.348	-.170	-1.416	.161	.907	1.102
	Familiar with effectuation	-.310	.272	-.136	-1.142	.258	.917	1.090
2	(Constant)	3.177	2.203		1.442	.154		
	Gender	.884	.342	.310	2.587	.012	.935	1.069
	Age	.016	.029	.069	.552	.583	.855	1.170
	Entrepreneurial courses	-.424	.360	-.147	-1.179	.243	.866	1.155
	Familiar with effectuation	-.277	.288	-.122	-.965	.338	.838	1.193
	Passion_for_inventing	.123	.352	.046	.348	.729	.755	1.325
	Passion_for_founding	.226	.237	.139	.951	.345	.625	1.599
	Passion_for_developing	-.168	.203	-.116	-.827	.411	.683	1.464

a. Dependent Variable: Effectuation_2

10.11.6 Hypothesis 3 – causation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.348[a]	.121	.070	1.260	.121	2.374	4	69	.060
2	.647[b]	.418	.356	1.049	.297	11.232	3	66	.000

a. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age

b. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.089	4	3.772	2.374	.060[b]
	Residual	109.627	69	1.589		
	Total	124.716	73			
2	Regression	52.141	7	7.449	6.774	.000[c]
	Residual	72.576	66	1.100		
	Total	124.716	73			

a. Dependent Variable: Causation_2

b. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age

c. Predictors: (Constant), Familiar with effectuation, Gender, Entrepreneurial courses, Age, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	5.659	.772		7.329	.000		
	Gender	-.238	.312	-.087	-.763	.448	.985	1.016
	Age	.020	.024	.097	.819	.416	.902	1.109
	Entrepreneurial courses	-.756	.325	-.275	-2.327	.023	.910	1.098
	Familiar with effectuation	-.389	.257	-.175	-1.513	.135	.955	1.048
2	(Constant)	.335	1.638		.205	.839		
	Gender	-.422	.265	-.154	-1.591	.116	.940	1.063
	Age	.036	.020	.179	1.766	.082	.859	1.164
	Entrepreneurial courses	-.391	.280	-.143	-1.398	.167	.847	1.181
	Familiar with effectuation	-.071	.222	-.032	-.318	.751	.884	1.131
	Passion_for_inventing	-.400	.207	-.200	-1.932	.058	.820	1.220
	Passion_for_founding	.404	.160	.290	2.531	.014	.671	1.489
	Passion_for_developing	.746	.171	.467	4.354	.000	.766	1.306

a. Dependent Variable: Causation_2

10.11.7 Hypothesis 4 – effectuation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.156[a]	.024	-.032	1.22620	.024	.435	4	70	.783
2	.188[b]	.035	-.065	1.24622	.011	.256	3	67	.857

a. Predictors: (Constant), Familiar with effectuation, Gender, Age, Entrepreneurial courses

b. Predictors: (Constant), Familiar with effectuation, Gender, Age, Entrepreneurial courses, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.614	4	.654	.435	.783[b]
	Residual	105.249	70	1.504		
	Total	107.863	74			
2	Regression	3.809	7	.544	.350	.927[c]
	Residual	104.055	67	1.553		
	Total	107.863	74			

a. Dependent Variable: Effectuation

b. Predictors: (Constant), Familiar with effectuation, Gender, Age, Entrepreneurial courses

c. Predictors: (Constant), Familiar with effectuation, Gender, Age, Entrepreneurial courses, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.816	.738		5.171	.000		
	Gender	.344	.303	.137	1.138	.259	.958	1.044
	Age	.014	.022	.077	.627	.532	.915	1.093
	Entrepreneurial courses	-.026	.317	-.010	-.082	.935	.898	1.113
	Familiar with effectuation	-.123	.243	-.062	-.507	.614	.939	1.065
2	(Constant)	2.712	1.993		1.361	.178		
	Gender	.312	.310	.124	1.006	.318	.941	1.063
	Age	.014	.023	.080	.621	.537	.875	1.143
	Entrepreneurial courses	.030	.329	.012	.092	.927	.862	1.161
	Familiar with effectuation	-.077	.258	-.038	-.297	.767	.862	1.160
	Passion_for_inventing	.016	.323	.007	.049	.961	.754	1.326
	Passion_for_founding	.149	.218	.105	.686	.495	.616	1.622
	Passion_for_developing	.008	.188	.006	.040	.968	.678	1.475

a. Dependent Variable: Effectuation

10.11.8 Hypothesis 4 - Causation

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.395[a]	.156	.107	.71963	.156	3.184	4	69	.018
2	.620[b]	.384	.319	.62839	.228	8.164	3	66	.000

a. Predictors: (Constant), Familiar with effectuation, Gender, Age, Entrepreneurial courses

b. Predictors: (Constant), Familiar with effectuation, Gender, Age, Entrepreneurial courses, Passion_for_inventing, Passion_for_developing, Passion_for_founding

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.596	4	1.649	3.184	.018[b]
	Residual	35.733	69	.518		
	Total	42.329	73			
2	Regression	16.267	7	2.324	5.885	.000[c]
	Residual	26.062	66	.395		
	Total	42.329	73			

a. Dependent Variable: Causation

b. Predictors: (Constant), Familiar with effectuation, Gender, Age, Entrepreneurial courses

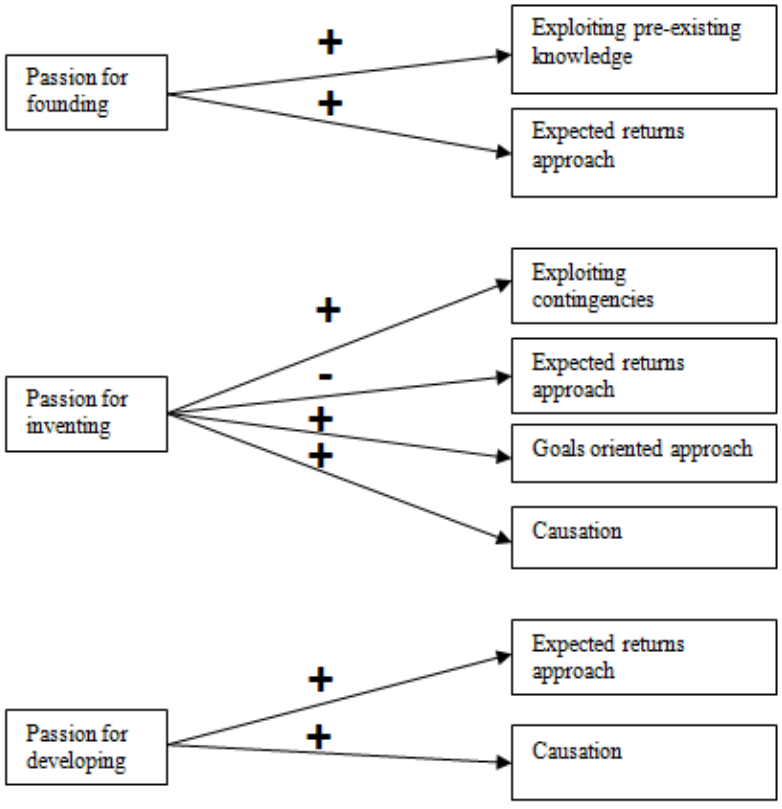
c. Predictors: (Constant), Familiar with effectuation, Gender, Age, Entrepreneurial courses, Passion_for_inventing, Passion_for_developing, Passion_for_founding

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	5.818	.442		13.172	.000		
	Gender	.000	.178	.000	-.002	.998	.956	1.046
	Age	-.002	.013	-.022	-.188	.851	.936	1.069
	Entrepreneurial courses	-.504	.188	-.312	-2.675	.009	.899	1.113
	Familiar with effectuation	-.237	.147	-.183	-1.609	.112	.948	1.054
2	(Constant)	1.620	.966		1.677	.098		
	Gender	-.126	.161	-.080	-.780	.438	.889	1.125
	Age	.008	.012	.071	.689	.493	.872	1.147
	Entrepreneurial courses	-.358	.172	-.222	-2.085	.041	.826	1.210
	Familiar with effectuation	-.132	.134	-.102	-.990	.326	.879	1.137
	Passion_for_inventing	.241	.130	.197	1.849	.069	.822	1.217
	Passion_for_founding	.108	.097	.134	1.123	.266	.659	1.517
	Passion_for_developing	.279	.090	.342	3.083	.003	.760	1.316

a. Dependent Variable: Causation

10.12 Overview predicting variables



10.13 Correlations

Correlations

			Passion_for_inventing	Passion_for_founding	Passion_for_developing	Effectuation	Causation	Causation_1	Effectuation_1	Causation_2	Effectuation_2	Causation_3	Effectuation_3	Causation_4	Effectuation_4	Causation_5	Effectuation_5
Spearman's rho	Passion_for_inventing	Correlation Coefficient	1.000														
		Sig. (2-tailed)	.														
	Passion_for_founding	Correlation Coefficient	.427	1.000													
		Sig. (2-tailed)	.000	.													
	Passion_for_developing	Correlation Coefficient	.354	.497	1.000												
		Sig. (2-tailed)	.001	.000	.												
	Effectuation	Correlation Coefficient	.003	.081	.044	1.000											
		Sig. (2-tailed)	.976	.473	.700	.											
	Causation	Correlation Coefficient	.275	.393	.391	-.061	1.000										
		Sig. (2-tailed)	.013	.000	.000	.587	.										
	Causation_1	Correlation Coefficient	.362	.213	.272	-.231	.709	1.000									
		Sig. (2-tailed)	.001	.056	.014	.038	.000	.									
	Effectuation_1	Correlation Coefficient	-.097	.010	.072	.871	.007	-.183	1.000								
		Sig. (2-tailed)	.387	.927	.525	.000	.951	.102	.								
	Causation_2	Correlation Coefficient	.041	.283	.381	-.076	.600	.368	-.056	1.000							
		Sig. (2-tailed)	.713	.011	.000	.501	.000	.001	.618	.							
	Effectuation_2	Correlation Coefficient	-.001	.150	-.010	.736	.018	-.192	.575	.015	1.000						
		Sig. (2-tailed)	.990	.180	.928	.000	.870	.086	.000	.896	.						
	Causation_3	Correlation Coefficient	.055	.275	.176	.087	.643	.290	.231	.080	.047	1.000					
		Sig. (2-tailed)	.623	.013	.117	.439	.000	.009	.038	.480	.674	.					
	Effectuation_3	Correlation Coefficient	.187	.125	.153	.799	.021	-.124	.561	.048	.515	-.028	1.000				
		Sig. (2-tailed)	.095	.267	.172	.000	.855	.268	.000	.670	.000	.803	.				
	Causation_4	Correlation Coefficient	.296	.279	.247	-.074	.568	.379	-.166	.277	.065	.167	.073	1.000			
		Sig. (2-tailed)	.007	.012	.026	.509	.000	.000	.140	.012	.563	.135	.515	.			
	Effectuation_4	Correlation Coefficient	.080	.147	.112	.734	.009	-.019	.547	.052	.404	.085	.660	-.042	1.000		
		Sig. (2-tailed)	.479	.191	.321	.000	.937	.868	.000	.646	.000	.450	.000	.709	.		
	Causation_5	Correlation Coefficient	.337	.173	.298	.095	.607	.303	.087	.323	.177	.196	.243	.411	.022	1.000	
		Sig. (2-tailed)	.002	.123	.007	.397	.000	.006	.439	.003	.113	.079	.029	.000	.844	.	
	Effectuation_5	Correlation Coefficient	-.095	-.067	-.101	.842	-.179	-.269	.742	-.159	.529	.037	.557	-.182	.543	-.074	1.000
		Sig. (2-tailed)	.399	.552	.369	.000	.109	.015	.000	.157	.000	.742	.000	.103	.000	.509	.

10.14 Entrepreneurial Passion items

Passion for inventing	It is exciting to figure out new ways to solve unmet market needs that can be commercialized.
	Searching for new ideas for products/services to offer is enjoyable to me.
	I am motivated to figure out how to make existing products/services better.
	Scanning the environment for new opportunities really excites me.
	Inventing new solutions to problems is an important part of who I am.
Passion for founding	Establishing a new company excites me.
	Owning my own company energizes me.
	Nurturing a new business through its emerging success is enjoyable.
	Being the founder of a business is an important part of who I am.
Passion for developing	I really like finding the right people to market my product/service to.
	Assembling the right people to work for my business is exciting.
	Pushing my employees and myself to make our company better motivates me.
	Nurturing and growing companies is an important part of who I am.