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UNIVERSITET

Department of Psychology

The role of time perspective bias and personality trait in subjective importance of perceived utility in future and present scenarios

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Bachelor thesis VT19

PSYK11

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Abstract

Willingness to take risk and analyzing the utility are one of the most important aspects that can be considered in personal decisions. Recent studies have shown that that one's perception of time and personality traits influence on perception of utilities. In this study a questionnaire with 162 questions was used. Questions were divided into three groups: future decision scenarios, a personality inventory and a time perspective inventory. The study included 83 individuals. Our results showed that there was a significant relationship between time perspective and subjective importance of perceived utility for past negative, related positive, and the two subcategorizations of the present perspective, fatalistic present perspective that was related negatively, and hedonistic present perspective that was related positively. Among the personality traits extraversion was a positive predictor for subjective importance of perceived utility.

Key words: Time Perspective, Personality Trait, Risk, Decision Making, Subjective Importance of Perceived Utility

Sammanfattning

Önskan att ta risk och analysera nyttan är en av de viktigaste aspekterna som kan beaktas i personliga beslut. Senare studier har visat att den egna uppfattningen om tid och personlighetsdrag påverkar uppfattningen av den upplevda nyttan. I denna studie användes ett frågeformulär av 162 frågor. Frågorna delades in i tre grupper: framtida beslutsscenarier, ett personlighetsformulär och ett formulär om tidsperspektiv. Studien omfattade 83 individer. Resultaten visade på signifikanta relationerna mellan tidsperspektiv och upplevd nytta för 'past negative', som var positivt relaterat, samt för sub-kategorin nutids perspektivet, där 'present fatalistic' var negativt relaterad och 'present hedonistic' var positivt relaterad. Bland personlighetsdragen var extraversion positivt relaterad till subjektiv betydelse av upplevd nytta.

Nyckelord: Tidsperspektiv, Personlighet, Risk, Beslutsfattande, Subjektiv Betydelse av Upplevd Nyttan

We would like to thank Jean-Christophe Rohner for enlightening support and input as our supervisor for this research.

Introduction

Global risks are intensifying. According to the Global Risk Report 2019, a survey by the World Economic Forum, where businesses, governments, civil society and thought leaders are asked to assess a number of risks and trends they stress that an estimated 800 million people lives are at risk from a sea-level rise by 0.5 meter within the next three decades; billions of citizens personal information has potentially been breached in just 2018; the spread of fake news with the help of artificial intelligence will outperform the spread of real news; humans' addictiveness to technology leads to prospering businesses, but to devastating consequences for humans, with social isolation and loneliness as result. These mentioned risks and trends are just a few of many that could have severe consequences for humans and life on earth. What was most concerning about this report was not the risks and trends themselves, but that the report concludes that divisions are hardening among, and within, countries, and a collective will to tackle these risks appears to be lacking (Global Risk Report, 2019). Consequently, to better understand these risks we believe it is important to also look upon them from the perspectives of random people and their psychology. After all, whether a risk will eventually turn out good or bad, more or less, traces back to daily life of all the small decisions and actions humans take guiding them on their path into the future. Thus, we will research the importance and utility of different scenarios and the corresponding probability of occurring that people perceive a scenario to have.

Due to the fact that the selection of alternatives in a decision-making context is often complex and can be influenced by a large number of factors, there is no universal model we can apply to make the right or best decision (Beresford and Sloper, 2012). However, several studies show that among the factors that affect the process of selecting one choice, personality and human temporal perspective can play important roles (Naroori and Karazee, 2015; Amanollahi, Hosseini, Zarrin, & Safara, 2016).

We ask ourselves, how are decisions influenced by the domination of one or more traits of personality? How can the perception of time be determinative for humans to give different values to the factors that affect preference? How do personality traits and temporal perspectives influence human subjective importance of perceived utility in relation to possible future scenarios? Possible future scenarios that are constructed based upon the global risks and trends identified by the World Economic Forum. These three questions will be argued for in this work.

The expected utility theory

Psychologists have always been interested in finding out if it is possible to describe the process of decision making. According to the father of utilitarianism, Jeremy Bentham, utility

is an abstract term which is the total sum of happiness an individual composes to it (Dumont & Neal, 1830). One of the most well-established theories which explains the decision-making process is the expected utility theory. Based on this theory, if a decision maker faces different alternatives, he or she might choose one of them by comparing their expected utility values (Broome, 1985). The main point of this theory is based on the hypothesis that each person has stable and coherent preferences and follows a systematic pattern in choosing preferences. A person makes a summation of the utility of all alternatives multiplied by their probabilities, then comes to the point of which alternative gives the highest expected utility (Mongin, 1997). In some contexts, where choices must be made, probability is not the issue of a decision-making problem, when risk instead is the main issue. Corresponding to these two concerns, uncertainty and risk, two versions of expected utility theory are introduced: subjective expected utility theory (SEUT) in subject to uncertainty, and von Neumann- Morgenstern Theory (VNMT) in the case of risk (Mongin, 1997).

According to the Subjective Expected Utility Theory, the preference structure is postulated by two main acts: the decision maker's evaluation of alternatives by their utility powers and the subjective decision maker's estimation of the probability of the alternatives. At last the subjective evaluation of these two acts leads the decision maker to choose one of the alternatives (Karni, 2014). The main contribution of the Subjective Expected Utility Theory is that it provides pattern that give structure to the decision which can be defensible and justifiable (Iqbal, 2013).

The main distinguishing feature of the von Neumann–Morgenstern utility function from the subjective expected utility theory is that VNMT tries to provide the comprehension of how one perceives the utility by adding the dimensions of risk appraisalment to evaluation of alternatives or outcomes. For example, a person will not take a risk to lose \$50 for a 10% chance to win \$500 and 90% chance to win \$0. In other words, utility (\$50) > 10% utility (\$500) + 90% utility (\$0). It follows that because utility is a subjective term, when it is viewed from the VNMT perspective, different people have different axiomatic approaches to evaluate utility and the risk assessment is one of the evaluations that a person consider in his/her approach when choosing one option (Mongin, 1997).

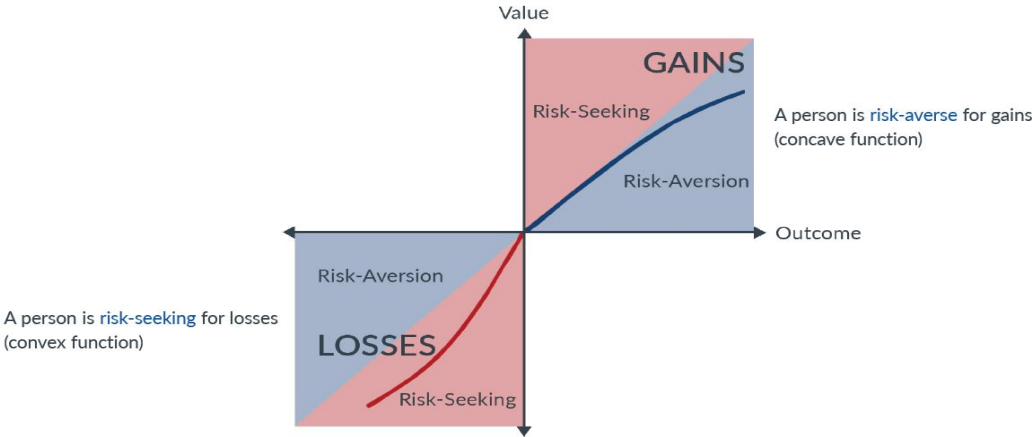
Because of the linearity of the probability scale, which was proposed by expected utility theory, the pattern of evaluation of alternatives is systematic and fixed and there is an independent relation between utility and probability in the expected utility model. Prospect Theory emerged as an alternative which resolved those limitations (Kahneman & Tversky 1979). Based on prospect theory, alternatives are valued not only by the absolute value of the

final result - as proposed by the expected utility - but are also based on the amount of gain and loss that a decision maker recognizes during the moment of the decision (Robinson-Riegler & Robinson-Riegler, 2004). Prospect theory proposes that a decision maker does not always choose the alternative that has the greatest expected utility. In some issues or domains, a person may choose an option that is not-optimal based on the expected utility theory. Therefore, a decision might be made where the greater factor in the decision-making process is drawn from an evaluation of gain and losses (Kahneman & Tversky, 1979).

Values of gains and losses, and their corresponding function can be seen in Figure 1. There it can be seen that the value the decision maker attaches to gains increases more slowly as a function of the size of the gain, compared to what it does for the negative value a person places on the losses, as a function of the size of the loss. Basically, humans feel losses more acutely than they do for gains (Kahneman & Tversky, 1979).

Figure 1.

Prospect Theory: The Value Function



Source: Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47(2), 263-291.

Hypothetical value function proposed is prospect theory.

As pointed out both in the expected utility theory and the prospect theory, the choice of an individual depends not only on the overall utility of the choice, but also on the potential benefits of that choice.

Big Five Personality Trait

Personality traits have been considered the core of analyzing why one person acts in a specific way in some situations, which pattern of the behavior one has and how one chooses his or her personal values, such as achievement (McCrae & Costa, 2003).

The Big Five-factor model, or five factor model (FFM) - one of the well-known personality models - consists of an enormous selection of traits that are combined into five extensive trait perspectives, which are agreeableness, conscientiousness, neuroticism, extraversion, and openness. They indicate a large set of related behavioral characteristics (Parks-Leduc, Feldman and Bardi, 2015). Extraversion shows individual differences in social engagement. A person with a high level of extraversion is sociable, talkative and ready to express feeling and emotions. He or she is also optimistic about the future, ambitious to receive rewards, assertive, outgoing, and energetic. In contrast, an introvert person likes to be socially and emotionally reserved and is close-minded. Agreeableness indicates differences in level of cooperation. A person with a high level of agreeableness puts trust in people and forgives easily. He or she is sympathetic and helpful and pays specific attention to others right and preferences. Conscientious individuals are oriented to be responsible and are efficient in gaining achievements. Thus, being goal-oriented and productive, this person tries to be organized and to perfectly do one's duties. The neuroticism trait dimension describes human differences in the frequency and intensity of negative emotions. Highly neurotic individuals tend to experience anxiety, sadness, and mood swings. Finally, an individual with a high level of openness enjoys analyzing and learning, is attracted to art and intellectual ideas, and creates original ideas (Parks-Leduc, Feldman and Bardi, 2015).

Time Perspective Bias

Interestingly, there is more than just the personality trait that are of importance when it comes to behavior. Humans might have different plans in life. A person's present and future plans can be related to his/her perception of time. That is, how a person sees him/herself in the past, which image one has in relation to one's future, and how this person takes steps in the present. These can all be important in deciding what actions can be taken. Indeed, humans' perception of time is crucial in daily life by how it affects behavior, emotion, motivation and selection. It is a kind of process which is shaped by the influences of how a person has been growing up, his/her religious belief, educational background, the political system and the economic situation the person has experienced and has been living in (Desmyter & De Raedt, 2012).

Time perspective is defined as the "non-conscious process whereby the continual flows of personal and social experiences are assigned to temporal categories, or time frames, that help to give order, coherence, and meaning to those events" (Zimbardo & Boyd, 1999).

According to Zimbardo and Boyd (2008), a person might be unaware of the influence of the perspective of time bias in everything he/she does, but he/she cannot ignore its role. They

claim, in their theory, which is called time perspective theory, that there are five time zones in temporal time frames. These zones or biases are categorized according to a person's psychological time--the way that personal experiences are divided into separable time. These five psychological zones or biases are divided into: past negative, past positive, present hedonism, present fatalism, and future (Zimbardo & Boyd, 2008).

Briefly, a person who has a tendency to be oriented to the past is used to think about the past and connects his/her actions in the present with events and emotions from the past. (Zimbardo and Boyd, 2008). There is a concept that describes proportionally the atmosphere of mind of the past oriented person, and that concept is "nostalgia". A past oriented person has no stress in the present because of the nostalgic feelings experienced in the present. This means that events and emotions experienced in the present are closely related to what has already been experienced in the past. Therefore, a past oriented person puts no attention to the new changes in his/her actions (Desmyter & De Raedt, 2012).

As is mentioned above, there are two sub categorizations in the past time orientation: past positive and past negative orientations (Zimbardo and Boyd, 2008). The past positive person has pleasurable memories from the past that he/she tries to keep his/her relationship with, for example memories that remind him/her of the sentimental and pleasurable dimensions of the past. Contrary, a person with a past negative perspective is stuck in the abuse and rejection he/she has experienced in the past. In addition, he/she puts more focus on missed opportunities. In other words, one with a past negative dimension remembers traumatic experiences and has a pessimistic view of the past which is the result of negative regretful life experiences (Zimbardo and Boyd, 2008).

The orientation to the present dimension indicates that 'now' means everything. No matter what has happened in the past or what is going to happen in the future, living in the present is the preference (Zimbardo and Boyd, 2008). Generally, a present oriented person is not active in doing his/her tasks, instead he/she has a tendency to wait for tasks to be solved by others or by receiving support from others. A present hedonistic perspective, is concerned with living in the moment, taking risks, searching new activities that just bring pleasure, and being careless about the future consequences of the emotions and behaviors that they experience in the present. In contrast, the present fatalistic person is one with a high tendency to feel helpless. This person believes that fate controls human life and nothing is under human control, the reason being this person's hopeless attitude. This person does not engage in being involved or managing any activities or situations because fate is decisive (Desmyter & De Raedt, 2012).

The future orientation is a mental time travel that one has with a high intensity for focusing on goals, the gains and losses of such goals, and a willingness to sacrifice immediate gratification. The future oriented person is a rational decision maker with a non-concrete insight for the future consequences of the alternatives that one chooses. A future oriented person tries to prioritize meeting and work deadlines and to fulfill all the requirements to achieve one's goals. This is achieved by sacrificing present pleasure and enjoyments (Zimbardo and Boyd, 2008).

The most well-established and comprehensive inventory of studying time perspective and its dimensions is called Zimbardo time perspective inventory (ZTPI). By theoretical analysis using techniques such as in-depth interviews, focus groups and feedbacks from participants, ZTPI was developed. Factor analysis was applied to determine most of the dimensions of time perspective in a various set of different cultures (Zimbardo and Boyd, 2008). In the Zimbardo and Boyd (1999) original theory the analysis of the data set led them to concluded that there were five distinct dimensions of time perspectives. More recent studies by Carelli, Wiberg and Wiberg (2011) have criticized the lack of a balanced future dimension as well as the original future dimension being overly positive of the ZTPI. Consequently, Carelli et al. (2011) conducted research on validating a Swedish version of the original ZPTI as well as hypothesized and validated a sixth dimension, a negative future orientation. Košťál, Klicperová-Baker, Lukavská, Lukavský (2016) contributed with further investigation of this proposed sixth dimension, negative future, on a larger and representative sample. They found, in line with previous mentioned research, that the five-trait time perspective inventory was a slightly better model fit than the six-trait version. They also found, in line with Carelli et al. (2011) results, that the future negative trait was strongly correlated with the past negative trait. However, Košťál et al. (2016) conducted their research using a short version of the original Zimbardo time perspective inventory and three of the eight items developed by Carelli et al. (2011) for the negative future scale. To our knowledge, this sixth dimension with the eight corresponding new items developed by Carelli et al (2011) have not been tested empirically in English on a large and representative sample.

Previous research

Regarding the relationships between personality traits and general decision-making styles, Bayram and Aydemir (2017) have studied such relationships. They found that a person who was high on extraversion had an orientation to come to immediate decisions as quickly as possible. The agreeableness trait was mostly related to searching for advice and guidance from others and making decisions based on feelings and premonitions. The conscientiousness and

openness personality traits had a tendency to use reasoning and logical approaches to make decisions (Bayram & Aydemir, 2017). According to the definition of utility is a term related to the achievement of a person's gains by choosing one alternative among the others that brings the highest degree of happiness/pleasure (Dumont & Neil, 1830). It can be deducted that one with high level of conscientiousness and openness traits, does the reasoning to evaluate the utility of the options to choose between. On the other hand, a person with agreeableness trait might appraise the utility of alternatives based on the feeling and emotions that he/she has.

In addition, Narooi and Karazee (2015) have also investigated the relationship between personality traits and decision-making styles. They found a significant connection between the two by using the big-five personality traits questionnaire developed by McCrae and Costa (2003) and a decision-making questionnaire developed to distinguish between a rational, a dependent, an avoidant and an intuitive decision-making style. Rational decision-making is a sort of process which consists of comprehensive search for information, do the reasoning and apply the structural pattern to choose one option. The dependent decision-making style is related to getting direction and support from others before making a decision. The intuitive decision-making is a style in which a person is dependent upon experience feelings and puts more attention to details in the flow of information instead of doing principled search. Finally, the avoidant decision-making style is a process of postponing, moving back and trying to avoid making a decision. As a result of the decision-making styles, people evaluate a situation differently and might come to a conclusion of contradicting utilities such as whether the person like something or not. This was, for example, researched by Narooi and Karazee (2015) that found a significant negative relationship among extraversion, openness, agreeableness, and all the decision-making styles. Neuroticism was found to be significantly positive related to the decision-making styles. For the last personality trait, conscientiousness, they found that there was no significant relationship with different decision-making styles. These results are also consistent with other research that has proved that there is a relationship between personality traits and decision-making styles. While decision making is interpreted as the processes that is taking place until one comes to a conclusion of which alternative is the better one to choose. The important conclusion with regards to Narooi and Karazee (2005) and Bayram and Aydemir (2017) findings is that the personality impacts the perception and evaluation of a decision-making problem. Expressed more clearly an individual's personality will impact how an individual perceive the importance and probability of occurrence of a utility in a decision-making problem. According to Mongin (1997) the decision maker is a utility maximizer in that he/she will choose the alternative that corresponds to the highest utility with regards to the

probability of it occurring. Consequently, with regards to the definition of utility Mongin (1997) provide, utility is not only a central part of the decision-making process, but personality is also a central part of the expected utility the individual perceives.

Sharpe, Martin and Roth (2011) researched optimism in relation to the personality traits and found concluding evidence for a strong relationship between optimism and extraversion, agreeableness and conscientiousness while it was negative for neuroticism. Mann, Kato, Figdor & Zimbardo (1999) referenced in Zimbardo and Boyd (1999) found a positive relationship between optimism and the future trait in researching cancer patients.

Kairys (2010) and Amanollahi et al. (2016) have studied the correlation between different dimensions of time perspective and personality traits. They claim that the future perspective is positively associated with conscientiousness. The present hedonistic, on the other hand, was directly associated with openness, creativity and the search for new things. While the past negative had a direct relationship with aggression and negative emotions which is the characteristics of the neuroticism personality trait. Kairys (2010) also concluded a modest positive correlation between present fatalistic and neuroticism, and a modest positive relation between present hedonistic and extraversion.

Regarding the relationship between human decision making in the context of time, Ryack (2015) studied the role of time perspective of financial advisors on their decision-making. In Ryack's study, an individual with a strong present orientation, tended to emphasize the current patterns of the decision alternatives more, such as their convenience and the immediate benefit or outcome (the expected utility) that they provided. In contrast, a person with a high intensity of future time perspective focused more on the potential long-term benefit and tends to put his/her current rewards on delay, due to the expected gain (utility) of some desirable future state.

Another research was conducted by Jochemczyk, Pietrzak, Buczkowski, Stolarski and Markiewicz (2017). Their research was specifically focused on the present hedonistic time perspective bias and decision makers who were risk takers. They found that individuals who focused on the hedonistic aspects of the present were positively related to be more interested in choosing risky alternatives, this instead of evaluating alternatives systematically based on the expected utility.

In summary, previous research findings suggest that personality traits and time perspective bias had a notable effect on the decision-making process involving estimating utility, evaluating options and choosing the alternative with highest expected utility. For this reason, this study is based on the input of theories concerning the role of the Big Five

personality traits and the five Time Perspective Biases in the process of choosing one’s preference--expressed as a utility--to future global scenarios involving a risk element or a major change to “status quo”.

The Psychology of Mind in relation to the Global Future Scenarios

In accounting for personality, the outgoing and optimistic characteristics of an extrovert person suggest a strong positive orientation towards subjective importance of perceived utility of global future scenarios (GFS). This expected impact can also be found in Table 1 summing up expected impact from the personality traits. For the person with a high level of agreeableness upon evaluating, complex, global future scenarios where there is no obvious access to guidance suggest that this person will take on a more cautious approach, i.e. a weak relation. On the margin the agreeableness person's attention to other rights and preferences, a sympathetic and helpful behavior, suggest a positive orientation to subjective importance of perceived utility of global future scenarios. The logical and reasoning approach of a conscientious person and a person with a high level of openness should result in strong positive orientation to subjective importance of perceived utility of global future scenarios. On the other hand, the conscientious persons goal-oriented (although reaching the goal is uncertain) and responsible characteristic suggest just only a weak positive orientation towards global future scenarios. In addition to the previously hypothesized positive relation between openness and the global future scenarios, the characteristic traits of the openness traits which favors a general interest in knowledge, intellectual thinking and original ideas suggest a positive orientation. This person will be stimulated by the risks and trends, and reason that the global future scenarios could bring new opportunities and breakthroughs that could lead to advancement for humanity or such. The anxiety and non-stable nature of a neurotic person and the escaping nature when faced with different situations suggest a negative orientation towards the global future scenarios. Besides this, the avoidant nature of the neurotic person suggest they will have a tendency to not expressing a particular stance on the global future scenarios suggesting weak impact.

Table 1. Summation of the hypothesized impact each personality trait will have on global future scenarios.

Impact on GFS	Psychological construct
Strong positive	Extrovert
Strong positive	Openness

Modest positive	Conscientiousness
Weak positive	Agreeableness
Weak negative	Neuroticism

The documented strong positive correlation between conscientiousness and the future perspective suggest a positive orientation towards the global future scenarios. More specifically, the future traits optimistic bias with a focus on long-term benefits suggest a rational approach, and a modest positive orientation towards the global future scenarios. This can also be seen in Table 2 below accompanied by all other constructs. Depending on whether a high or low discount rate is used in the process of discounting the global future scenarios it will impact the size of the impact it will have on the global future scenarios. Given the complexity and gravity of the approximated global risks and trends, we expect a cautious approach, with a modest to high discount rate, and as consequence, a low to modest impact on subjective importance of perceived utility towards the global future scenarios.

The risk-taking attitude of a present hedonistic person suggest a curious orientation that not only implies a strong impact, but also an open attitude towards the future that implies a positive orientation towards global future scenarios. This hypothesis is also supported by the documented positive correlation found between openness and present hedonistic.

The opposite is expected for the present fatalistic person. Actually, the present fatalistic persons inactive role in making decisions, with a belief that a predetermined fate controls everything and humans have no control, suggest a strong negative orientation towards the global future scenarios. The present oriented person emphasis on immediate benefits suggest a strong impact upon evaluating future scenarios. Positive past oriented person has this bias to capture and interpret the present in light of a warm and sentimental attitude toward the past. Then she/he thinks and evaluates the future scenarios by a general nostalgic view of the past and gives a modest positive orientation towards global future scenarios. Contrary, negative past oriented person has a bias to capture and evaluate the present in light of a generally unhappy and unpleasant view of the past. Therefore she/he thinks and interprets the future scenarios by reflection of negative views of the past and gives a modest negative orientation towards global future scenarios.

Table 2. Summation of the hypothesized impact each psychological construct will have on global future scenarios.

Impact on GFS	Psychological construct
Strong positive	Extraversion
Strong positive	Openness
Strong positive	Present hedonistic
Modest positive	Past positive
Modest positive	Conscientiousness
Weak positive	Agreeableness
Weak positive	Future
Weak negative	Neuroticism
Modest negative	Past negative
Strong negative	Present fatalistic

Purpose

The purpose of the study is to investigate the global future (and present) scenarios' subjective importance of perceived utility and whether the subjective importance of perceived utility can be explained by the big five personality trait and/or human's temporal perspective.

To achieve this goal, we would like to answer the following questions:

- Are there any correlations, and predictive power, between the big five personality traits and subjective importance of perceived utility of the scenarios?
- Are there any correlations, and predictive power, between time perspective biases and subjective importance of perceived utility of the scenarios?
- Does personality and time perspective, in combination, have predictive power on the subjective importance of perceived utility of the scenarios?

In relation to these research questions we have formulated ten hypotheses:

Hypothesis 1: The personality trait neuroticism will be negatively related to subjective importance of perceived utility.

Hypothesis 2: The time perspective bias of past negative will be negatively related to subjective importance of perceived utility.

Hypothesis 3: The time perspective bias present fatalistic will be negatively related to subjective importance of perceived utility.

Hypothesis 4: The personality trait agreeableness will be positively related to subjective importance of perceived utility.

Hypothesis 5: The personality trait openness will be positively related to subjective importance of perceived utility.

Hypothesis 6: The personality trait conscientiousness will be positively related to subjective importance of perceived utility.

Hypothesis 7: The personality trait extraversion will be positively related to subjective importance of perceived utility.

Hypothesis 8: The time perspective bias past positive will be positively related to subjective importance of perceived utility.

Hypothesis 9: The time perspective bias present hedonistic will be positively related to subjective importance of perceived utility.

Hypothesis 10: The time perspective bias future orientation will be positively related to subjective importance of perceived utility.

Method

Participants

The survey was accessed by 127 persons. In total, 83 people (which of 6 did not enter any background information) completed the survey. Among the survey participants 47 were from the Nordic countries, among which 39 were from Sweden. In total the sample covered persons with a background from 25 different academic fields and 20 different countries on the northern hemisphere, from Canada in the western to China and Malaysia in the east. More details of sample and the samples varied background can be seen in Table 3.

Those who participated in the study were recruited by sharing the questionnaire via email, in various Facebook groups, and by posting on our own Facebook page. The form was then shared on Facebook by friends of friends' friends and spread out in acquaintance circles, both through direct contact and via e-mail. The selection of participants was based on a selection

of comfort in which those who were reached by the form were given the opportunity to answer as well as a quota selection where certain groups (at the authors workplace) were searched specifically according to their background and present life situation (Svartdal, 2001).

Table 3. Demographic background of sample

Demographic	M*	unit
All	77	persons
Woman	37	persons
Age, average	40	years
<i>21-30</i>	18	persons
<i>31-40</i>	31	persons
<i>41-</i>	28	persons
Have children	36	persons
Nordics	47	persons
Europe ex. Nordics	13	persons
Africa	-	persons
Asia	15	persons
Americas	2	persons
City size, average, 1000s	157	thousands
<i>1-20</i>	16	persons
<i>21-160</i>	16	persons
<i>161-1,000</i>	18	persons
<i>1,001-25,000+</i>	27	persons
<i>Education, average</i>	15	years
Employeed	28	persons
Empl. + Student	13	persons
Self-Empl.	8	persons
Self-Empl + Student	3	persons
Student	22	persons
Another situation	3	persons
Monthly Income, average	2,665	USD
<i>-1,250</i>	23	persons
<i>1,250-1,800</i>	12	persons
<i>1,800-2,600</i>	14	persons
<i>2,600-4,000</i>	16	persons
<i>4,000-</i>	12	persons

Design

After considering the nature of the research questions a survey was chosen. Data was obtained by conducting an Internet survey. Considering the scope of the research on global risks and trends, reaching out with the questionnaire across the world was considered very important. A minimum of 50 respondents were set as this was considered possible given the study's framework and sufficient to draw conclusions about respondent's psychology in relation to the presented scenarios. Respondents answers to three questions (like, importance and probability) for each presented scenario were used to calculate the subjective importance of perceived utility. The subjective importance of perceived utility was calculated as $\text{Like} \times \text{Importance} \times \text{Probability}$. The subjective importance of perceived utility was the dependent variable in a linear regression analysis where personality trait and/or time perspective bias were used as independent variables. Then for answering the research questions regression analysis was applied.

Procedure and Instrument

For the collection of data, a survey was conducted where a digital questionnaire of a total of 162 questions was used, plus 33 background questions. Questions were divided into three groups: future decision scenarios, a personality inventory and the time perspective inventory. Respondents were informed that the study researched decision making, personality and time perspectives, that participation was anonymous and voluntary, and that they had the opportunity to interrupt their participation whenever they wanted. They could also contact the authors via email. The questionnaire was designed in Survey Monkey. Respondents, if they liked, could start the survey and finish it at a later time (partly countering the risk of fatigue of a comprehensive survey). On average the survey took 45 minutes to complete. Data were collected over a 2-week period.

The participants, after a brief written information review and approval of the study's conditions, completed the questionnaire. First decision making scenarios were presented to the respondent which was expected to evaluate the scenario and come to a conclusion estimating their perceived like, importance and probability in relation to 32 scenarios about a possible futures or present state. Then questions about personality and time perspective followed. At last, questions about respondent's perception of time and effort, and demographics and socio-economic questions completed the survey. In the first section of the survey respondents read

and answered 32 different scenarios. Each scenario was presented with a broad categoric heading¹ and the specific topic (the risk or trend identified by the World Economic Forum).

The future decision scenarios in the survey was constructed by the report author Carlsson. The scenarios were based secondarily on the World Economic Forum report The Global Risk Report 2019 and primarily on the Strategic Intelligence Insights. Each of the 45 major strategic intelligence insights identified by the World Economic Forum related to global risks was investigated. The intelligence behind the 45 major insights, and the directly related key issues to each insight, a total of 319 unique issues and insights, were researched in more detail. Throughout the analysis of the 45 major topics thirteen were excluded. Five of these thirteen were countries, associations of countries or political unions of countries. The other eight were directly, or indirectly, related to at least one of the already selected major topics, and thus, partly captured already.

Each formulated scenario followed a standardized structure: “In the future, ‘**context**’ it might ‘**possible outcome**’.” The standardized formulation assured resemblance which helped the respondent to maintain focus on the context of each described scenario and what might occur, addressing fatigue. Each scenario was formulated as neutral as possible to avoid framing the respondent. There were specifically two exceptions to this last rule of thumb where the following two scenarios ‘Illegal Economy’ and ‘Public Finance and Social Protection’ were deliberately unidirectional. For each scenario the respondent provided a rating of a utility (1 very bad, 7 very good), a rating of the importance (1 very unimportant, 7 very important) of the scenario a probability of the scenario occurring (1 very unlikely, 7 very probably).

One examples of scenarios from the survey will exemplify:

“Forests

In the future the global population is expected to grow with 600-700 million people every 10 years for the next three decades. To be able to produce the necessary food to feed the global population, in which the world is already being short in supply of, it might be necessary with deforestation (primarily rainforests).”

- 1. Do you consider what might occur to be?
1 2 3 4 5 6 7
1= Very Bad, 4= Neutral, 7= Very Good
- 2. Do you consider this topic to be?

¹ There were eight broad categories and four scenarios within each category.

1 2 3 4 5 6 7

1= Very unimportant, 4= Neutral, 7= Very important

3. Do you consider the likelihood of what might happen to be?

1 2 3 4 5 6 7

1= Very unlikely, 4= 50/50, 7= Very probably

After the 32 scenarios were answered then the respondent answered a ten-question personality trait inventory. Each respondent provided a rating on a 5-point Likert scale (strongly agree, strongly disagree). Then the time perspective bias inventory followed where the respondents provided a rating on a 5-point Likert scale (very untrue, very true). Lastly the respondent completed a set of background and demographics questions.

Questions relating to measuring the five factor personality traits, openness, conscientiousness, extraversion, agreeableness and neuroticism were based on an existing short-form consisting of ten questions (Rammstedt and John, 2007). The corresponding Swedish questions originated from Zakrisson (2010). Five of the ten questions were reversed in calculating each respective trait. For example, “Tends to find fault with others” which was reversed, while “Does a thorough job” was not.

The inventory relating to measuring Time Perspective Bias, past positive, past negative, present hedonistic, present fatalistic and future, where a total of 56 questions (Zimbardo and Boyd, 1999), where the Swedish questions originated from Carelli et al, (2011). Out of the 56 questions five were reversed upon calculating each of the time perspective trait. For example, “If things don’t get done on time, I don’t worry about it.” was reversed and “Fate determines much in my life. “was not reversed.

After collecting the data, each of the score for the three questions asked in each scenario were transformed and adjusted from its 7-point Likert scale. For the likeability score it was centered around 0 (neither good nor bad) with a range from +1 (good) to -1 (bad). All scenarios were created with the perspective of what might occur in relation to certain criteria. The criteria were that the outcome of the presented scenario should contribute to a future state, of a greater good, positive growth (beyond economic and materialistic terms) and/or to safeguard privacy for the individual. In practice this meant that some scenarios, when they were rated bad, that score was a good outcome, seen from the perspective of a greater good. Among the 32 formulated scenarios, eleven scenarios were framed in the opposite direction compared to the other 21 scenarios. Besides from including reversed scenarios that help ensure that respondents remained focused and thoroughly read each scenario, these eleven scenarios were reversed to

be able to assure that the aggregated subjective importance of perceived utility across all scenarios could be interpreted in the same way i.e. a high score on the Likert scale was a good outcome for any given scenario. For each of the eleven scenarios were the score had to be reversed it was multiplied with -1. The importability and probability score were centered around 0.5 with a range greater than 0 and less than 1. These transformations provided us with two indices that were used to assess the impact (importance) the likeability had on the respondent and the expected (probability) utility it had for each respondent. From the transformed data we took the product of the score for the likeability, the importability and the probability for each scenario. The product of the three variables gave us the subjective importance of perceived utility score, which had a theoretical maximum of 0.8622 and theoretical minimum of -0.8622. A positive score on the global future scenarios implies an increased subjective importance of perceived utility for the global future scenarios and a negative score a decreased subjective importance of perceived utility of the global future scenarios on earth.

Ethics

During the study's implementation, the individual protection requirement has been met through several measures. In the questionnaire used, participants were initially given information about the purpose of the study, that is, that the author's intended to investigate the decision making, personality and time perspectives. The participants also received information that participation was voluntary and that they at any time had the right to cancel the study. In addition, information was provided that the survey was completely anonymous. In order to move on to the questions that were to be answered, all participants had to confirm their participation.

The study could include people from the age of 15 up to 115. Since all participants were over 15 years of age, the parent's consent was not needed, this is according to rule 2 of the Swedish Research Council research ethics principles (Vetenskapsrådet, 2002).

Since a questionnaire was used, it was easy for respondents to interrupt its participation in the event of any discomfort. Because the form was filled in anonymously and without the presence of those who completed the study, the report authors considered that the participants should not have experienced any pressure to fill out the form.

Data analysis

Given the scope of the scenarios and the number of questions, if the survey were completed in less than 30 minutes the respondent were removed from the sample. There were

twelve respondents that completed the whole survey in between 7 to 26 minutes, with an average time of 18 minutes².

All answers were screened for outliers and if the raw score was less probable than $p=0.001$, in a normal distribution, they were removed. The outlier screening resulted in 25 raw scores being removed from the dataset. To safeguard against multicollinearity the correlation matrix was studied. No correlation was found to exceed ± 0.65 , well below the threshold level of ± 0.80 , and thus the presence of multicollinearity was concluded non-existing. Test of normality using QQ-plots confirmed that data was approximately normally distributed. Since it was only approximately normally distributed complementary tests of normality using Kolmogorov-Smirnov test with alpha 0.001 were conducted (Real-Statistics). The test concluded that data were indeed, in general, normally distributed. However, among the scenarios there were seven questions (six scenarios: forests, human rights, water, future health and healthcare, digital economy and society, and climate change) violating the assumption of normality according to the Kolmogorov-Smirnov test. For five of these seven, it was either for, the degree of importance or the degree of probability, that the assumption of normality was violated³. For two of the questions that violated the assumption of normality it related to the likeability of the presented scenario. The first scenario was:

“Forests”

In the future the global population is expected to grow with 600-700 million people every 10 years for the next three decades. To be able to produce the necessary food to feed the

² These respondents were consequently removed from the sample to mitigate the risk of them not having read each scenario and all questions thoroughly. Further investigation into these twelve respondents' responses revealed that the majority demonstrated highly volatile results, and for half of these respondents, on average all response across the scenarios were close to neutral. That could suggest, that respondents answered randomly with no clear idea or opinion in relation to the presented scenario. Besides that, the demographics data suggest that only two were native Swedish or English-speaking implying that the larger part of these twelve respondents could have found it difficult to understand the survey questions due to the barrier of language.

³ This is not that unexpected as the presented scenarios are considerably important affecting humans in general, and some perhaps even being considered as a fundamental human right in life (such as access to food and/or water) by the respondent. Moreover, although scenarios are described in a way that they could happen in the future some of them, more or less, are already present for many humans, especially for a large part of the sample with a background from advanced economies. This should, consequently, result in a skewed distribution curve for some probability questions. Consequently, we find no reason to transform or exclude the data for these five questions.

global population, in which the world is already being short in supply of, it might be necessary with deforestation (primarily rainforests).”

and, the second scenario were:

“Human Rights”

In the future growing resource scarcity globally (of food, water and shelter) and deteriorating equality among people might threaten the realization of human rights (likely to hit developing economies harder than advanced economies).”

For both of these questions it was a considerable negative skewness (left-skewed). However, since it is only for two scenarios, the skewness will have a limited impact on the aggregated subjective importance of perceived utility across all 32 scenarios. For information about the test for normality of personality trait and time perspective please see this footnote⁴. The Kolmogorov-Smirnov test for non-normality in age, size of the city and the income level they were are all rejected at $p=0.05$, confirming that the sample were diverse and balanced in regards of these variables. Moreover, the samples distribution of gender and having a child or no child were also well balanced. Given the normality of the data and the linear relationship between independent and dependent variables the residuals are expected to be normally distributed. Thus, all assumptions for the use of linear regression are, approximately, satisfied. Moreover, residuals from the regression were also checked to assure homoskedasticity, and that the assumption of linear dependency were indeed accurate.

Result

The results from the correlation study is illustrated in Figure 2. The correlations were in general limited, with the exception of six correlations, which of three were statistically significant, at $r(71) > +/- 0.30, p \leq 0.01$. The lower right quadrant demonstrated relatively high correlation between the personality traits as well as with the time perspectives. That being said, no correlation was higher than 0.65. The other two quadrants illustrate, in general, various correlation between the personality traits and time perspective with the different groups of scenarios. Six correlations were statistically significant at $r(71) > +/- 0.30, p \leq 0.01$. For the main model, the subjective importance of perceived utility of the global future scenarios, it was only one correlation that it was statistically significant with and that were present fatalistic, $r(71) = -0.38, p < 0.001$.

⁴ For personality traits there were three questions, and for time perspectives there were twenty-one questions, that violated the assumption of normality according to the Kolmogorov-Smirnov test. That corresponds to about 33 percent of the questions for each psychological inventory.

Figure 2.

Correlation Matrix	Perceived utility	Agreeableness	Conscientiousness	Extraversion	Neuroticism	Openness	Past Negative	Present Hedonistic	Future	Past Positive	Present Fatalistic
Perceived utility		0.04	0.29	0.30	-0.18	0.16	-0.15	0.06	-0.01	0.14	-0.38***
Agreeableness	0.04		0.29	0.49***	-0.47***	-0.16	-0.48***	0.19	-0.27	0.34**	-0.26
Conscientiousness	0.29	0.29		0.31**	-0.39***	0.08	-0.39***	0.13	0.11	0.34**	-0.34**
Extraversion	0.30	0.49***	0.31**		-0.36**	-0.05	-0.37**	0.27	-0.31**	0.34**	-0.27
Neuroticism	-0.18	-0.47***	-0.39***	-0.36**		-0.05	0.60***	-0.12	0.10	-0.33**	0.44***
Openness	0.16	-0.16	0.08	-0.05	-0.05		0.08	0.17	0.11	-0.02	-0.05
Past Negative	-0.15	-0.48***	-0.39***	-0.37**	0.60***	0.08		0.05	0.10	-0.45***	0.65***
Present Hedonistic	0.06	0.19	0.13	0.27	-0.12	0.17	0.05		-0.13	0.20	0.33**
Future	-0.01	-0.27	0.11	-0.31**	0.10	0.11	0.10	-0.13		0.09	-0.25
Past Positive	0.14	0.34**	0.34**	0.34**	-0.33**	-0.02	-0.45***	0.20	0.09		-0.38**
Present Fatalistic	-0.38***	-0.26	-0.34**	-0.27	0.44***	-0.05	0.65***	0.33**	-0.25	-0.38**	

Correlation matrix of dependent and independent variables

Note. The correlation matrix for all topics, domains, the global future subjective importance of perceived utility index and psychological constructs.

Light grey highlight correlation >+/- 0.25; dark grey highlight correlation >+/- 0.50;

* = two-sided p-value <0.05; ** = two-sided p-value <0.01; *** = two-sided p-value <0.001.

Descriptive statistics

The product of likeability, importability and probability made up the subjective importance of perceived utility of global future scenarios which average was $M = 0,12$, $SD = 0,15$. The interested reader will find all unique scenarios accompanied by descriptive statistics in Appendix 1 (Figure 4 to 11).

Subjective Importance of Perceived Utility of Global Future Scenarios Model

The standardised regression model using personality trait as independent variables to predict the subjective importance of perceived utility of global future scenarios was statistically significant $F(5, 65) = 2.72$, $p = 0.027$. Detailed data of the results can be seen in Table 4 below. The model captured 17 percent of the variability in subjective importance of perceived utility. Extraversion was the only variable with a statistically significant beta.

Table 4. Regression results using personality traits as independent variables

Variable	B	Beta	t	P-value	95% CI
Intercept	0.014	0.000	0.004	0.499	[-0.05, 0.05]
Openness	0.053	0.029	1.142	0.129	[-0.02, 0.08]
Neuroticism	-0.039	-0.016	-0.538	0.296	[-0.08, 0.04]
Extraversion	0.104†	0.065†	2.239	0.014	[0.01, 0.12]
Conscientiousness	0.110†	0.044	1.616	0.055	[-0.01, 0.10]
Agreeableness	-0.072	-0.038	-1.227	0.112	[-0.10, 0.02]
R ²	17%				
Df	65				
F	2.72†				

Note. t = t-statistic; p-value = significance level of beta; CI = confidence interval of beta; R² = rate of variability captured by the regression model; df = degrees of freedom; F = F-statistic of regression model;

† = one-sided p-value < 0.05; †† = one-sided p-value < 0.01; ††† = one-sided p-value < 0.001.

With time perspective as independent variables the model was statistically significant with $F(5, 65) = 4.25$, $p = 0.002$ and captured 25 percent of the variability as can be seen in Table 5. Consequently, the model is adequate in explaining future subjective importance of perceived utility for global future scenarios presenting a large risk or trend of complex nature using time perspectives as independent variables. Present fatalistic was significant with a negative beta. Present hedonistic and past negative were both statistically significant with a positive beta.

Table 5. Regression results using time perspectives as independent variables

Variable	B	Beta	T	p-val	95% CI
Intercept	0.213†	0.000	0.004	0.498	[-0.05, 0.05]
Present Fatalistic	-0.411†††	-0.160†††	-4.309	0.000	[-0.23, -0.09]
Past Positive	-0.017	-0.009	-0.306	0.380	[-0.06, 0.05]
Future	-0.131	-0.040	-1.533	0.065	[-0.09, 0.01]
Present Hedonistic	0.199†	0.058†	2.153	0.018	[0.00, 0.11]
Past Negative	0.158†	0.068†	1.956	0.027	[0.00, 0.14]
R ²	25%				
Df	65				
F	4.25††				

Note. t= t-statistic; p-value = significance level of beta; CI = confidence interval of beta; R2 = rate of variability captured by the regression model; df=degrees of freedom; F = F-statistic of regression model;

† = one sided p-value < 0.05; †† = one-sided p-value < 0.01; †††= one-sided p-value <0.001.

The results from the model, found in Table 6, using both sets of psychological constructs as independent variables was statistically significant with $F(10, 60) = 2.73, p < 0.027$. The model captured 31 percent of the variability. However, there was only one statistically significant variable, present fatalistic, with a negative beta. This suggest that, with only one out of ten independent variables being statistically significant, the independent variables can be reduced in the model to reduce the risk of overfitting the data.

Table 6. Regression results using personality trait and time perspectives as independent variables

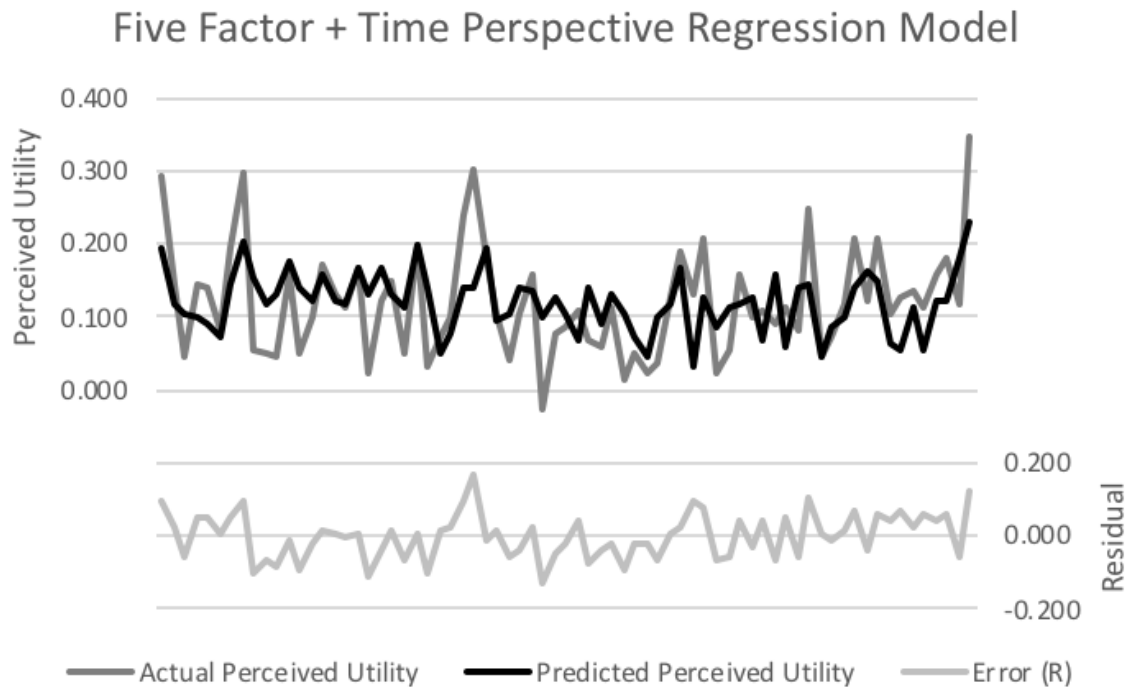
Variable	B	Beta	T	p-val	95% CI
Intercept	0.174	0.000	0.004	0.498	[-0.05, 0.05]
Present Fatalistic	-0.370†††	-0.139†††	-3.452	0.001	[-0.22, -0.06]
Past Positive	-0.024	-0.013	-0.441	0.330	[-0.07, 0.04]
Future	-0.149	-0.041	-1.408	0.082	[-0.10, 0.02]
Present Hedonistic	0.155	0.042	1.375	0.087	[-0.02, 0.10]
Past Negative	0.147	0.063	1.654	0.052	[-0.01, 0.14]
Openness	0.021	0.014	0.558	0.289	[-0.04, 0.06]
Neuroticism	-0.001	0.001	0.017	0.493	[-0.06, 0.06]
Extraversion	0.051	0.037	1.189	0.120	[-0.03, 0.10]
Conscientiousness	0.097	0.042	1.523	0.067	[-0.01, 0.10]
Agreeableness	-0.075	-0.039	-1.268	0.105	[-0.10, 0.02]
R ²	31%				
Df	60				
F	2.73†				

Note. t= t-statistic; p-value = significance level of beta; CI = confidence interval of beta; R2 = rate of variability captured by the regression model; df=degrees of freedom; F = F-statistic of regression model;

† = one sided p-value < 0.05; †† = one-sided p-value < 0.01; †††= one-sided p-value <0.001.

Figure 3 present a graph of the unstandardized regression model that combined both the personality trait and the time perspective as independent variables to predict the subjective importance of predicted utility of global future scenarios. There was an especially good fit for the right half of the sample. Residuals were evenly distributed around zero and there was no indication of heteroskedasticity for none of the three regression models. In general, the models rarely captured extreme values well.

Figure 3.



Graph of actual and subjective importance of predicted utility from the global future scenario combined regression model

Discussion

In current study, the aim was to contribute to the understanding of how personality trait and time perspective bias are linked to the subjective importance of perceived utility in decision making. Decision making that constitutes a person's perception of utility in reaching a decision on present and/or future real-life complex scenarios can be explained by human personality traits and time perspective biases. Based on the theory of expected utility, a person tends to choose the alternative with the least risk and highest score of utility and probability of it to occur. According to the prospect theory, alternatives with high score of gains have a high chance to be selected by decision-makers. In our research, investigating the importance of utility the respondent perceived, the results conclude that some of the personality trait (extraversion) and time perspective (present fatalistic, present hedonistic and past negative) bias were directly related to the subjective importance of perceived utility being part of the decision-making process in evaluating global future scenarios.

Time perspective bias

Among the hypothesis for the time perspective bias it was claimed that the present fatalistic perspective (hypothesis 3) had a tendency to rate low subjective importance of perceived utility. The **present fatalistic perspective** lack of hope outlook exerts an important

influence on the way fatalistic present perceives and process information. More specifically, when nothing is under human control, no wonder that he/she has a hopeless attitude. Given the fact that this traits perception of actions not being determined by oneself, then one is not responsible for one selves action, and if faced with situations beyond his/her control there will be a negative reaction towards it. When there is no freedom to choose how he/she reacts and even by taking in to account reactions, everything will be in the order that it must be, hope would be meaningless. According to all the mentioned points, there are some possible explanations for a negative relationship between subjective importance of perceived utility and fatalistic perspective. First, he/she will never have any incentive to take responsibility and be active in doing something. Second the explanation must be interpreted regarding the concept of 'fate' in relation to the fatalistic present perspective. Taking the relationship between fate and a fatalistic belief into consideration, it is understandable why fate is the most important factor in determination of a fatalistic perspective. In the fatalistic belief, which is obvious from its name, everything is determined by fate. Every event, good or bad, can be considered as a fate's decisions. One must accept what is happening to him/her because it cannot be changed by anyone. By incorporating the relationship between present and the fatalistic points of view about life, it will provide a better understanding of why the present fatalistic gives a negative load to subjective importance of perceived utility of global future scenarios demonstrating a somewhat complex nature.

In the second hypothesis related to past positive bias, ninth hypothesis regarding to present hedonistic and tenth hypothesis related to future orientation were stated that all these time perspective biases were positively related to subjective importance of perceived utility. As regards the results concerning the relationship between subjective importance of perceived utility and time perspective, **present hedonistic** and **unexpectedly past negative** were the two positive predictors of subjective importance of perceived utility among the time perspective biases researched. It could be reasonably argued that a person with present hedonistic perspective has this tendency to deal with information with ongoing enjoyments in their minds are usually more likely to put his/her attention to the prospective short-term satisfactions that might be associated with risky decisions and behaviors. A positive relationship between present hedonistic and subjective importance of perceived utility may be explained by the fact that the pleasure derived from current experiences affects one's perception to consider all kinds of possible future outcomes positively. One should also not overlook the fact that present hedonistic perspective is associated with being careless about the consequences of the emotions and behaviors that one experiences. Therefore, instead of analyzing utility of subjects, he/she

considers utility of choices with the scale of pleasure and excitement. In accordance with the risk taking of this perspective, it might be a marked tendency for one to perceive utility positively. Another possible explanation can be related to one of the studies that was mentioned in the previous researches where it was claimed that there is a significant relationship between present hedonistic and openness. Taking the characteristic of openness trait into consideration, it is remarkable why present hedonistic puts his/her value on pleasure. One who is pleasure-oriented is likely to be more open to change, compared to those who are not. When it is viewed from this point of view, that a person who is pleasure-oriented have more tendencies to move toward new experiences and search for creativity compared to those who do not have this pleasure oriented value system, it might be interpreted as another reason why present hedonistic perceives utility positively. Given that all scenarios were considered important to various degrees, by respondents, it is not unexpected that the present hedonistic demonstrated such strong statistical significance and high coefficient when used as a predictor.

As it was mentioned, the finding of a positive coefficient for the **past negative** bias was unexpected and was in contradiction to what was claimed in our hypotheses. One reasoning of ours for this finding relates to the time perspective biases in particular, but also to a lesser degree the personality trait, autobiographical characteristic. This suggest it might be important to consider the functioning of the human brain in people relating to the evaluation process of their perception of future scenarios that could have a significant impact on daily life. More specifically, in a decision-making context choosing between alternatives (i.e. expected utilities) that might contradict one's autobiographical characteristic the functioning of the human brain might provide insights into how a person could be expected to evaluate different alternatives. Carelli and Olsson (2012) have found through, using neuroimaging methods, neural correlations in the brain in relation to the time perspective biases. Fellous, Armony and LeDoux (2002) found that in relation to how the brain detects and evaluates emotional stimuli that the amygdala played a major role. The involvement of the limbic system and its connectedness with other parts of the brain involved with emotional behavior suggest it might be important considering this systems role in relation to a person's personality. The autobiographical nature of the time perspective bias and the role of mental time travel in relation to decision making might be of particular importance (Abraham, Schubotz & Von Cramon, 2008). The autobiographical nature of the past trait was specifically addressed by Carelli and Olsson (2012) fMRI study demonstrating activation of the medial frontal cortex (Brodmann's area 10 or rostral PFC). In addition to their findings Burgess, Dumoutheil & Gilbert (2007) conclude from research on lesions that this particular region is directly related to performance impairments

firstly on open-ended situations that require self-organized behavior. For example, they reason that these situations are typically underspecified in terms of what is the correct way of behaving, when the course of action is very diverse and lastly when the individual must self-determine what is constituted as success of the specific situation. And secondly, performance impairments were also found for situations where self-maintained attending behavior was required. For example, they reasoned that were the case when maintaining response consistency. Accompanied by previous discussed results Hassabis, Kumaran, Vann and Maguire (2007) concluded in researching patients with hippocampal amnesia that they had problems imagining new experiences. Thus, they revealed that the hippocampus was directly involved in imagining self-relevant future events, and more generally speaking, the construction of fictitious experiences. Moreover, they argued that the interconnectedness between imagined experiences and episodic memories, mediated by the hippocampus, may fundamentally affect the ability for a person to re-experience or reconstruct past events. In relation to these previous research results it is not unreasonable to expect that people in responding to our scenarios, open for interpretation in how they will impact the respondents life in terms of good or bad in the future, and their option to express their sought for behavior in this presented future scenario will activate the limbic system. Consequently, for the negative past time perspective where the past is perceived having a high negative utility. For example, “painful past experiences keep being replayed in my mind” or “I’ve made mistakes in the past that I wish that I could undo”, two questions of past negative time perspective trait (Zimbardo & Boyd, 1999). The limbic system will try to leave behind this unpleasant past (negative) state by engaging in a behavior of avoidance towards the known negative past, or what resembles such a state. Thus, the individual might be imagining new experience of a future state, exemplified by our scenarios, and self-determine what is perceived as “success” i.e. might bring positive utility from their imagination, relative to his or her past experiences. Thus, instead of being stuck with the negative utility that characterizes the negative past trait, where everything is considered bad, this person might deliberately seek a positive utility possibly found in a future state. This could provide an explanation of why the negative past demonstrated a significant positive orientation towards the global future scenarios. This stand in big contrast to the expectations from previous research where the past oriented persons is expected to put no attention to new changes in actions. But that being said, the global future scenarios only exemplify a certain state that resembles a decision-making context. A state in which a person is only asked to subjectively evaluate the subjective importance of perceived utility it will bring them, not any actions they might or might not take. Another challenge interpreting the unexpected sign of the past negative bias is that

previous research finding of a positive correlation between past negative and the proposed future negative bias. Consequently, our past negative variables might be “contaminated” with the variability of respondents reasoning that would be better captured by a future negative bias if it would have been accounted for.

If future research will be able to prove previous reasoning correct that would also imply that the past positive bias should also result in an opposite impact in contrast to our formulated hypothesis. Interestingly, although not statistically significant, the past positive bias does indeed have a negative coefficient in our research on subjective importance of perceived utility of global future scenarios. Hypothetically speaking, for the past positive what are already facts and known of the past is perceived as having a high utility. For example, last year was much better than this year, or previous job role was much better than the current. The positive past defends this state and these emotions due to their high, and known, positive utility. Hence, in the evaluative process that takes place upon reaching a decision about a future state (a state characterized by big challenges and/or possible changes to life and status quo as the perceives it) the limbic systems will emphasize the strong and positive known utility for the positive past trait. This given the past traits nostalgic orientation to life. The future state will therefore be perceived with skepticism, and possibly as a threat. That in turn is expected to result in avoidance of the alternative future state. The utility of the decision-making alternatives for the future state will as consequence be evaluated as having a negative utility. Consequently, a negative orientation towards the global future scenarios would not be unexpected for the positive past bias as a deliberate effort to safeguard the positive utility the person is already experiencing from the known positive past.

Personality trait

From the results it is apparent that among all personality traits that were stated among the hypothesis that are positively and negatively related to subjective importance of perceived utility, extraversion was the only one being statistically significant. It was claimed to have a positive orientation to subjective importance of perceived utility. Individuals who have a high level of **extraversion** are adventurous; therefore, they are enjoying the engagement with the outside world. Because one of the basic features of extraversion is talkative and assertive, they can easily express their feelings, which indicates that they might take the risk to put trust in people. Individuals with a high degree of extraversion are often described as a person who have positive ideas and attitudes toward life, as well as being energetic and highly adaptable. They have no concern about what others think about them and they do not react negatively to accept new experiences. To put more attention to the potential benefits derived from new experiences

and changes which lead a person with a high extraversion trait to give high score to subjective importance of perceived utility of future scenarios and to weight those utilities more heavily in their perception.

Conclusions

From our study, it appears that time perspective is a particularly important person variable for guiding people's decisions in relation to subjective importance of perceived utility - more so than the personality dimensions of the five-factor model.

However, we must mention that a number of important limitations need to be considered in our study. First, the current investigation was limited by the scenarios written in English and Swedish and the participant selection mostly consisted of people with Swedish and English as their mother tongues - the participants who spoke a different language might translate it into their own languages. This can lead to a potential problem regarding the validity of their own translation compared to the original version in English and is something that should be kept in mind when analyzing the results of the current study. Another limitation lies in the fact that the conducted study is directed towards the fact that a self-assessment form has been used. This can compromise the study's validity because the participant can deliberately or unknowingly provide incorrect information. This may be due to a lack of self-insight or that the person dares to be honest in their answers for various reasons. There is also the risk of the participant asking for help by someone else nearby. In addition to this, questionnaires can be criticized because you can never be sure that people have responded properly and spent time on the survey, some may want to get ready as quickly as possible without giving the form the time required to get such accurate and valid results as possible. One last limitation is the size of the sample which not only limits the possibility to generalize the results, but also need to be taken into account when considering the results from the combined model (with 10 independent variables).

One critique for the study is that the survey was long as it was expected to take the respondent about 45 minutes to answer all questions carefully. Although precautions were taken analyzing the data, removing respondents from the sample, some participants expressed that they experienced some scenarios difficult to understand which we, due to all answers being anonymous, could not account for. Both might be threats to the internal validity. A critique for our results is our choice of researching the subjective importance of perceived utility. This makes it difficult to make direct comparisons with other studies where utility has been researched using personality and/or time perspectives has been used as independent variables. That being said, we have found no similar study of global future scenarios making comparison with other research limited in practice.

In future research, it might be possible to include more countries and more importantly a larger sample, which can be deputizing a large number of different continents for comparison of time perspective bias, big five personality trait and subjective importance of perceived utility of global future risk and trend scenarios. It could also be interesting to research whether there are any differences based on demographic background. For example, are there any differences between men and women that have had a child or not, are there any differences due to age, level of education, size of city they live in, annual income or total net worth.

Instead of researching personality traits it might be more interesting to account for decision making style instead. And last but not least, future research should use a balanced measure of the future state by including the negative future bias in the time perspective questionnaire.

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Appendix 1

Over the next 8 pages, all 32 scenarios respondents answer to is presented in Figure 4 to 11. Each figure shows the specific formulated scenario in the middle. To the left of each question the scenario, i.e. the key risk or trend identified by the World Economic Forum, is presented. The key risk or trend and the formulated scenarios in the questionnaire was presented to the respondent. To the right of each formulated scenario descriptive statistics are found. Data is presented for Likeability (L), Importability (I), Probability (P) and Subjective Importance of Perceived Utility of Global Future Scenarios (U). For each of these measures M = Mean (average) score is presented. The average score is also presented with a statistical comparison against the average score for each measure corresponding total average across all scenarios. Thus, a statistical analysis where a comparison was made for the likeability against its average of 0.200, importability against its average of 0.724, probability against its average of 0.628, subjective importance of perceived utility of global future scenarios against its average of 0.121. For each of these indices a mutual order for M and SD is presented in the two right most columns of each figure. A low rank for M, i.e. 1, reveals that this scenario demonstrated the highest average among all 32 scenarios for its specific index. A high rank for SD, i.e. 32, reveals that this scenario demonstrated the highest standard deviation among all 32 scenarios for its specific index. Thus, a low rank on M and SD reveals high score with high consensus on average among all respondents (for example, in Figure 4 the forest scenario and the importance score where participants perception is that whether cutting down forests or not is important and there is a high consensus for that among respondents).

* = two-sided p-value < 0.05; ** = two-sided p-value < 0.01; ***= two-sided p-value <0.001.

Figure 4.

Scenario	Question	M*	SD	95% CI	M	SD
Sustainable Development	In the future, unchanged taxes and prices of goods and services, and large changes in individual life style choices to satisfy sustainable development on earth be enough. But it might be that higher prices and taxes of goods and services and an unchanged individual life style will also be enough.	L -0.08***	(0.55)	[-1.18, 1.03]	28	18
		I 0.68*	(0.15)	[0.39, 0.98]	27	26
		P 0.56*	(0.21)	[0.15, 0.98]	26	21
		U -0.05***	(0.29)	[-0.63, 0.54]	28	25
Forests (R)	In the future the global population is expected to grow with 600-700 million people every 10 years for the next three decades. To be able to produce the necessary food to feed the global population, in which the world is already being short in supply of, it might be necessary with deforestation (primarily rainforests).	L 0.61***	(0.54)	[-0.47, 1.68]	2	22
		I 0.84***	(0.12)	[0.59, 1.08]	1	32
		P 0.70**	(0.19)	[0.32, 1.07]	7	24
		U 0.38***	(0.40)	[-0.43, 1.18]	1	3
Globalisation	In the future an increasingly connected and open world via communication might enable anyone with the right skills and competences to compete for a job no matter who, human or robot, they are or where they come from/are located.	L 0.15	(0.57)	[-0.99, 1.30]	20	12
		I 0.74	(0.14)	[0.45, 1.02]	14	30
		P 0.71***	(0.18)	[0.34, 1.07]	4	28
		U 0.10	(0.36)	[-0.62, 0.83]	21	9
Aviation, Travel and Tourism (R)	In the future longevity and substantially more people globally being in the middle income class group seeking travel might result in travel restriction to cope with the environmental impact that comes from travel.	L -0.25***	(0.56)	[-1.37, 0.86]	30	16
		I 0.71	(0.16)	[0.38, 1.03]	21	17
		P 0.57	(0.24)	[0.08, 1.06]	24	2
		U -0.14***	(0.32)	[-0.78, 0.50]	31	20

Question 1 to 4, accompanying scores and descriptive statistics.

Figure 5.

Scenario	Question		M*	SD	95% CI	M	SD
International Trade and Investment	In the future free trade* and free flow of capital** might challenge an industry's competitiveness versus the same industry in another country. *free trade – sales and/or purchases of goods and services between countries with tolls. **free flow of capital – transfers of capital/money can take place without restrictions on amount or additional costs (taxes)	L	0.25	(0.52)	[-0.80, 1.30]	16	24
		I	0.73	(0.18)	[0.37, 1.09]	15	9
		P	0.65	(0.23)	[0.20, 1.11]	15	9
		U	0.18	(0.33)	[-0.47, 0.84]	11	18
Supply Chain and Transportation	In the future a more efficient supply chain that enables fast deliveries of goods and services might turn out to be more vulnerable to external threats that could cause disruptions.	L	-0.05***	(0.54)	[-1.14, 1.03]	26	21
		I	0.62***	(0.16)	[0.30, 0.95]	32	18
		P	0.61	(0.19)	[0.23, 0.98]	18	25
		U	0.00**	(0.30)	[-0.60, 0.60]	26	24
Internet of Things	In the future to increase resource allocation and the efficiency of the daily life of people, it might be required that different connected devices (IoT) in the homes, monitors consumption and usage of goods and services.	L	0.10	(0.67)	[-1.23, 1.44]	23	3
		I	0.66*	(0.21)	[0.24, 1.08]	30	4
		P	0.70**	(0.18)	[0.33, 1.07]	5	27
		U	0.12	(0.38)	[-0.63, 0.87]	19	8
Electronics	In the future, electronics and scientific breakthroughs will transform manufacturing and production systems. This will create significant efficiency gains that will impact economic growth, business models, employment and sustainability. The incorporation of these breakthroughs might make it necessary with a revaluation of the foundation society and the economy is built upon.	L	0.31	(0.49)	[-0.68, 1.29]	14	28
		I	0.71	(0.17)	[0.37, 1.05]	18	14
		P	0.67*	(0.18)	[0.32, 1.03]	11	30
		U	0.19	(0.31)	[-0.44, 0.81]	10	21

Question 5 to 8, accompanying scores and descriptive statistics.

Figure 6.

Scenario	Question	M*	SD	95% CI	M	SD
Future of Food	In the future the production of food will be reduced (a third of all food produced globally end up as waste, primarily coming from consumers in advanced economies), but it will be produced with a higher quality. This might result in scarcity of groceries in the store.	L -0.06***	(0.59)	[-1.24, 1.12]	27	10
		I 0.75	(0.16)	[0.42, 1.08]	9	19
		P 0.54***	(0.22)	[0.11, 0.97]	29	16
		U 0.01**	(0.29)	[-0.56, 0.59]	25	27
Water	In the future water scarcity will be a growing source of conflict. Global withdrawal over the past 100 years has grown twice as much as the global population. To combat the excess consumption of water it might be that a global price of water is introduced.	L -0.23***	(0.65)	[-1.53, 1.08]	29	5
		I 0.82***	(0.16)	[0.50, 1.13]	3	23
		P 0.60	(0.23)	[0.14, 1.07]	20	6
		U -0.11***	(0.42)	[-0.95, 0.72]	30	2
Information and Entertainment (R)	In the future businesses and/or governments knowledge of an individuals needs and wants, or what the individual believe it need or want, be so good that the it might impact the individuals own prerequisites to make a free and personal choice.	L 0.44***	(0.55)	[-0.66, 1.54]	5	19
		I 0.74	(0.17)	[0.40, 1.09]	10	11
		P 0.64	(0.23)	[0.18, 1.10]	17	7
		U 0.24**	(0.36)	[-0.47, 0.95]	8	11
Education and Skills	In the future, characterised by free movement of people, the incentives to safeguard employment and income might put pressure on the individual to improve their skills and competencies.	L 0.36**	(0.47)	[-0.57, 1.29]	12	29
		I 0.77*	(0.15)	[0.48, 1.06]	6	27
		P 0.78***	(0.14)	[0.50, 1.06]	1	32
		U 0.24**	(0.34)	[-0.44, 0.93]	7	15

Question 9 to 12, accompanying scores and descriptive statistics.

Figure 7.

Scenario	Question	M*	SD	95% CI	M	SD
Values (R)	In the future the right of freedom of speech and freedom of expression might be restricted because of concerns about trust.	L 0.19	(0.70)	[-1.21, 1.58]	18	1
		I 0.77*	(0.16)	[0.46, 1.08]	5	24
		P 0.58	(0.23)	[0.11, 1.05]	22	5
		U 0.07	(0.39)	[-0.72, 0.85]	23	5
Mental Health	In the future to protect people's mental health it may rest an increased responsibility on the supplier of a product and/or service for the possible impact that the usage or exposure of their product or service may or may not result in.	L 0.38**	(0.49)	[-0.61, 1.36]	9	27
		I 0.68	(0.21)	[0.26, 1.11]	26	3
		P 0.57*	(0.19)	[0.18, 0.96]	23	23
		U 0.18	(0.28)	[-0.37, 0.74]	12	30
Future Health and Healthcare	In the future the access to healthcare and necessary treatment might be conditioned on a persons choice of life style (such as exercise, diet and leisure activities).	L 0.15	(0.67)	[-1.20, 1.50]	21	2
		I 0.76	(0.17)	[0.42, 1.10]	7	13
		P 0.60	(0.21)	[0.17, 1.02]	21	19
		U 0.12	(0.36)	[-0.59, 0.83]	18	12
Human Enhancement*	In the future to improve weaknesses, or strengthening existing or acquiring a new skill beyond what is considered human normal capabilities it might be more common through technology. * for example, surgery of vision to obtain night vision or implanted electronic chips in the head for digital communication over the mobile network.	L 0.13	(0.66)	[-1.18, 1.44]	22	4
		I 0.66*	(0.21)	[0.24, 1.09]	29	2
		P 0.66	(0.22)	[0.22, 1.11]	13	11
		U 0.15	(0.34)	[-0.54, 0.84]	14	14

Question 13 to 16, accompanying scores and descriptive statistics.

Figure 8.

Scenario	Question	M*	SD	95% CI	M	SD
Illegal Economy	In the future, to provide a product, service or information, where there is a “known chance for positive outcome for the end user” and/or “no known risk of negative consequences for someone else but possibly the end user (given that the end user has been informed about the possible risk involved)”, might become legal as a means to protect the freedom of choice for everyone while assuring that the health, safety and well-being of others	L 0.06*	(0.57)	[-1.08, 1.20]	24	13
		I 0.64***	(0.16)	[0.32, 0.96]	31	22
		P 0.55**	(0.21)	[0.14, 0.97]	27	22
		U 0.02**	(0.29)	[-0.56, 0.60]	24	26
Citites and Urbanisation	In the future cities dependency on technology to improve efficiency might leave them more vulnerable to unpredictable disruptions (such as cancelled transports, lost grocery deliveries or Internet access failures).	L -0.29***	(0.54)	[-1.37, 0.78]	31	23
		I 0.69	(0.17)	[0.35, 1.03]	23	15
		P 0.57*	(0.21)	[0.14, 1.00]	25	18
		U -0.11***	(0.28)	[-0.67, 0.45]	29	28
Workforce and Employment (R)	In the future the freedom of work from wherever and whenever, with whoever and whatever will increase relationship with and belonging to new digital constellations of groups (digital societies) that goes beyond municipal, state or nation borders. This freedom might reduce relationship with and belonging in the physical society.	L 0.16	(0.60)	[-1.03, 1.36]	19	9
		I 0.71	(0.17)	[0.37, 1.05]	20	16
		P 0.66	(0.22)	[0.23, 1.10]	14	15
		U 0.09	(0.36)	[-0.63, 0.81]	22	10
Public finance and Social Protection	In the future, to provide a product, service or information, where there is “a known risk for negative consequences for someone” or “an unknown chance for a positive outcome for anyone”, might become illegal as a means to protect the health, safety and well-being of others.	L 0.32	(0.55)	[-0.78, 1.42]	13	20
		I 0.69	(0.20)	[0.28, 1.10]	24	5
		P 0.50***	(0.22)	[0.06, 0.93]	31	13
		U 0.14	(0.26)	[-0.39, 0.67]	15	31

Question 17 to 20, accompanying scores and descriptive statistics.

Figure 9.

Scenario	Question		M*	SD	95% CI	M	SD
Human Rights (R)	In the future growing resource scarcity globally (of food, water and shelter) and deteriorating equality among people might threaten the realisation of human rights (likely to hit developing economies harder than advanced economies).	L	0.61***	(0.45)	[-0.29, 1.52]	1	31
		I	0.78**	(0.14)	[0.49, 1.07]	4	29
		P	0.67	(0.21)	[0.24, 1.10]	12	17
		U	0.36***	(0.33)	[-0.29, 1.02]	2	17
Youth Perspectives (R)	In the future, if young people are underrepresented in global affairs, it might result in their perspectives and ideas not being accounted for.	L	0.40**	(0.51)	[-0.61, 1.42]	8	26
		I	0.74	(0.19)	[0.35, 1.12]	13	6
		P	0.46***	(0.25)	[-0.05, 0.96]	32	1
		U	0.13	(0.25)	[-0.38, 0.64]	17	32
Digital Economy and Society (R)	In the future to ensure personalised and easy to use goods and services, businesses and governments might take advantage of people's digital identity and usage data from their electronic devices.	L	0.47***	(0.56)	[-0.65, 1.60]	4	15
		I	0.74	(0.19)	[0.36, 1.13]	11	7
		P	0.68	(0.24)	[0.21, 1.15]	9	4
		U	0.28**	(0.39)	[-0.51, 1.07]	5	4
Cybersecurity	In the future because connected devices collect more and more data on what a person is doing, why, where, when, how much and how often it is used it might become illegal to store this type of data.	L	0.37*	(0.57)	[-0.76, 1.51]	10	14
		I	0.71	(0.19)	[0.33, 1.09]	19	8
		P	0.53***	(0.24)	[0.05, 1.01]	30	3
		U	0.18	(0.30)	[-0.43, 0.78]	13	23

Question 21 to 24, accompanying scores and descriptive statistics.

Figure 10.

Scenario	Question	M*	SD	95% CI	M	SD
Biotechnology	In the future scientific knowledge of the genome and biotechnology might be used to fix and/or cure diseases or problems caused by a person's own choice of life style. *the exploitation of biological processes, especially the genetic manipulation of microorganisms, for different purposes.	L -0.39***	(0.56)	[-1.51, 0.72]	32	17
		I 0.70	(0.16)	[0.38, 1.03]	22	20
		P 0.70***	(0.16)	[0.37, 1.03]	6	31
		U -0.25***	(0.35)	[-0.95, 0.45]	32	13
Climate Change	In the future to combat climate change it might be necessary to adjust daily habits and life style choices.	L 0.37*	(0.62)	[-0.87, 1.61]	11	6
		I 0.83***	(0.13)	[0.56, 1.09]	2	31
		P 0.73***	(0.23)	[0.28, 1.18]	3	8
		U 0.29**	(0.44)	[-0.60, 1.18]	4	1
Future of Energy	In the future subsidies and taxes used to manipulate the cost or income of goods or services might be restricted/stopped because of the imbalances and inefficiencies it creates in the allocation of resources. It can be subsidies on fossil fuel consumptions and solar panels, or high taxes on labour with risk of creating a shadow/illegal economy.	L 0.01**	(0.59)	[-1.16, 1.19]	25	11
		I 0.68*	(0.18)	[0.33, 1.03]	28	10
		P 0.54**	(0.22)	[0.11, 0.98]	28	14
		U -0.01**	(0.34)	[-0.69, 0.67]	27	16
International Security (R)	In the future to protect societies and citizens from global inequality and resource scarcity there might be an increase in border controls, gated communities, surveillance and identity controls.	L 0.24	(0.61)	[-0.98, 1.45]	17	8
		I 0.74	(0.16)	[0.43, 1.05]	12	25
		P 0.68	(0.21)	[0.25, 1.10]	10	20
		U 0.11	(0.38)	[-0.65, 0.86]	20	7

Question 25 to 28, accompanying scores and descriptive statistics.

Figure 11.

Scenario	Question	M*	SD	95% CI	M	SD
Migration	In the future, global competition for the consumer, especially digitally, there might be a greater need for diversity in talent and opinion, and international contact network in a company.	L 0.53***	(0.44)	[-0.35, 1.41]	3	32
		I 0.72	(0.17)	[0.38, 1.06]	16	12
		P 0.74***	(0.18)	[0.38, 1.09]	2	29
		U 0.34***	(0.31)	[-0.28, 0.96]	3	22
Geopolitics	In the future increased collaboration among countries to deal with global risk such as rising sea-levels, biological threats, deteriorating human health and a shift in power and values might increase costs in the short term but make it less costly in the long term.	L 0.43***	(0.46)	[-0.50, 1.35]	7	30
		I 0.72	(0.16)	[0.40, 1.04]	17	21
		P 0.60	(0.19)	[0.23, 0.98]	19	26
		U 0.24***	(0.28)	[-0.32, 0.79]	9	29
Information Technology (R)	In the future the usage of computers and technology for recreation and fun might lead to changed social skills in physical life "offline" compared to the digital life "online".	L 0.44***	(0.52)	[-0.61, 1.48]	6	25
		I 0.68	(0.22)	[0.23, 1.13]	25	1
		P 0.68	(0.23)	[0.23, 1.13]	8	10
		U 0.25**	(0.32)	[-0.40, 0.89]	6	19
Internet Governance (R)	In the future surveillance of personal internet usage (websites visited and apps usage) for improved security might lead to a violation of privacy and integrity.	L 0.26	(0.62)	[-0.98, 1.49]	15	7
		I 0.75	(0.15)	[0.46, 1.04]	8	28
		P 0.65	(0.22)	[0.21, 1.09]	16	12
		U 0.14	(0.39)	[-0.64, 0.92]	16	6

Question 29 to 32, accompanying scores and descriptive statistics.

