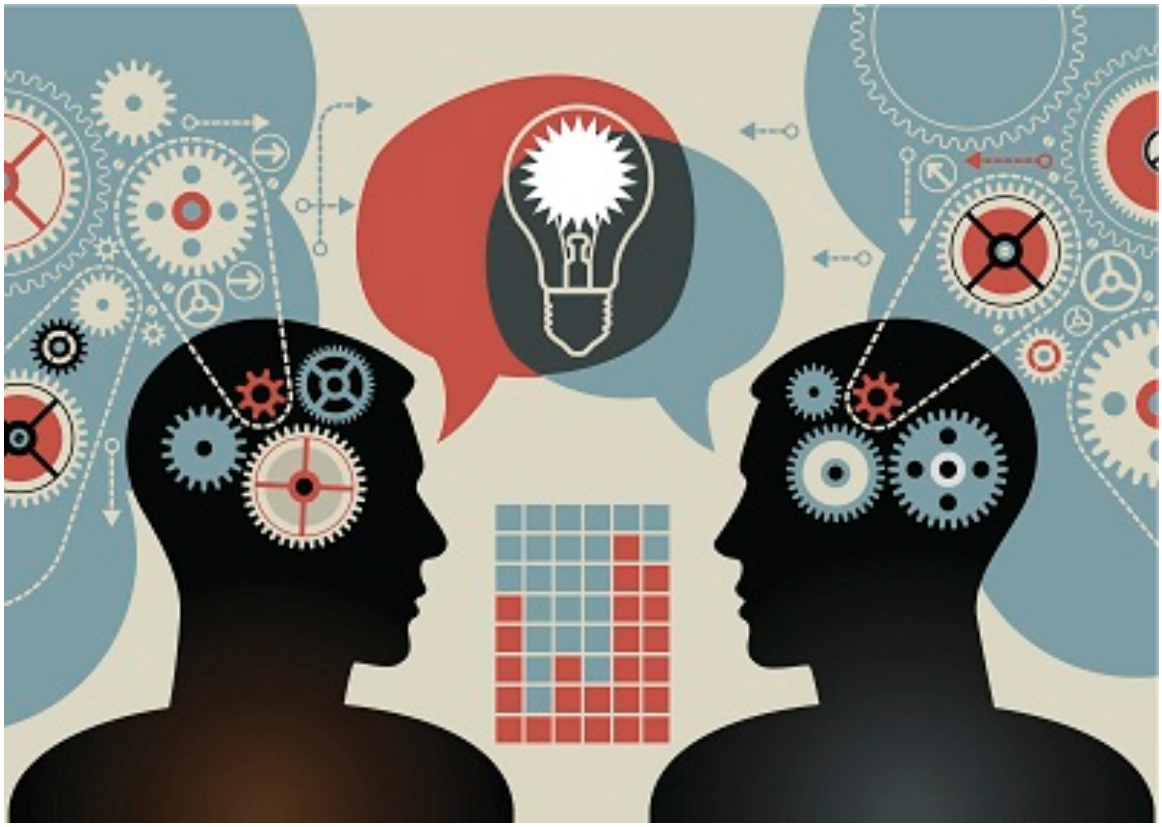
NANOTECHNOLOGY FOOD APPLICATION:

THE ROLE OF GOAL – PRODUCT MATCH AND PERSONAL BENEFIT PERCEPTION



M.Sc. Thesis

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MARCH 2017

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NANOTECHNOLOGY FOOD APPLICATION:

THE ROLE OF GOAL – PRODUCT MATCH AND PERSONAL BENEFIT PERCEPTION

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Study Load: 36 credits
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Abstract

Attitude of the public towards a novel technology is coevolve with the technology itself. It is the moment for this inspiring new technology—nanotechnology to open eyes for consumers' acceptance. Consumers swing between benefit and risk perception of a product during the process of attitude formation. The interesting subjects of this study would be the distinguishes among personal benefit/risk perception and societal benefit/risk perception. Personal benefit perception is placed biggest expectation. Moreover, another important stimulus in the model is the match relation between consumers' goals and application of the technology. The goal-match relation is believed to make differences on all perception types and it brings more weights to personal benefit perception on acceptance. The results of data studied by a survey showed the match does not play a special role. However, personal benefit perception is demonstrated to make significant effect on willingness to pay.

Key words: match; goal, application, personal benefit perception, societal benefit perception, personal risk perception, societal risk perception, willing to pay, acceptance

Acknowledgement

I am very thankful to my supervisor, Dr. Arnout Fischer. I felt lucky to have him as my supervisor from the first day we met to the last meeting we had. He supervised me on my thesis in a best way I can imagine and he became the mentor of my life as well during this half year. His help and kindness will influence me in my future life.

And I appreciate the contribution by participants of my questionnaire. They filled in the survey completely in time, which offers me good data.

I am grateful to my co-reader, Dr.Ynte van Dam. He helped me with critical thinking of the model and the methodology of collecting. And he has ever treated me with a cup of tea while I was waiting for the meeting with my supervisor.

At the end, I wish thank to all the friends who gave me help in this half year.

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Situation and Problem Statement

Comparing with the times when Galilei and Copernicus were prosecuted for their scientific work, innovations are generally assumed "positive" in the present era, which is a good sign for science development. However, resisting new technology seems to be a same age-old topic. Take two recent cases as examples, birth control pills and picture phone are both comparatively common applications nowadays, but they have ever been resisted by publics when they were just introduced to public (Sheth, 1979). In human's nature, uncertainty and dread will always loom as barriers for novelty (Slovic, 2000).

Perception of risks, instead of risks based on concrete evidence, leads individuals to avoid changes generated by new technology (Juma, 2016). Public may not possesses evidence of risks on specific technology but they are susceptible to perception of risks. New technologies are encountering a flourishing period, reflected in both amount and speed of development. The adapting of public opinion fell behind the introduction of novel technologies. A case in point, genetically modified food became one of the most controversial new technologies, representing public dread of loss and forgoing gains as price. United States has the biggest group who accept GM product. In spite of this, a choice experiment conducted by Huffman et al (2003) showed that the US consumers were willing to spend an average of 14% more for avoiding GM Product. (Yue, 2015) Technology promotion is quite a complicated issue.

In these recent 10 years, nanotechnology is one of the most important new technologies. Nanotechnology is expected to have at least $1 trillion impact globally by 2020, requiring at lowest 6 million workers (Roco, 2010). Nanotechnology is likely to be a next transformative technology in the future (Frewer, Fischer & van Trijp, 2011), enables both abundant improvement of properties of existing products and completely new product development (van Giesen, Fischer& van Trijp, 2016). The impact of nanotechnology processes, machines, and products is predicted to influence potentially nearly every "conceivable information technology, energy source, agricultural product, medical device, pharmaceutical, and material used in manufacturing" (Britannica,2016).

End-consumers started to be access to nanotechnology applications in market directly. For example, dendrimers in drug delivery was shown to be a potential efficient tool for cancer treatment (Rahimpour, 2012). In agriculture, nanocomposites such as fullerenes and bukyballs were used for weeding and to fertilize soil (Frewer, et al, 2014). In terms of engineered materials, microscopic "Nano whiskers" were molecularly hooked onto natural and synthetic fibers to clothing and other fabrics for strengthen stain resistance. And for invisible sunscreens that block ultraviolet light, it utilized zinc oxide nanocrystals (Britannica, 2016).

Consumers have relatively little experience and knowledge about nanotechnology, which bring opportunities for Nano products whereas there have not been established view and judgement in public yet. Nevertheless, consumers can still have pre-estimate on a novel technology-based product. Getting insight from van Giesen's study (2015), consumers tend to go through affect process than cognition during attitude formation when they encounter unfamiliar objects. Consumers might not able to judge a novel technology dominantly through cognition process without sufficient knowledge and experience. Risk and benefit-based judgement is still available through affect process. In 2013, by evaluating consumers' willingness to pay (WTP), Bieberstech et al. (2013) concluded that consumers in France and Germany resist to accept Nano-food. We can say the situation is not completely optimistic for nanotechnology.

Experts and researchers mostly tend to embrace innovative technology utilized on food product since this group have understanding of technique benefits the innovation promises. End-consumers, the laypeople are standing on a less aware position, with different appraisal structure, are more vulnerable to perceive actual benefit from novel technology-based food product (Bearth& Siegrist, 2016). As a result, end-consumers intend to know what risk might be decreased and what risk would be imposed by new technology when there is no good benefit communication. As a result, consumers is likely to overestimate the consequence of risk perception (Bruhn, 2007).

Most researchers investigated pressingly on risk perception. Large parts of literatures are based on risk perception of public than benefit perception (Bearth& Siegrist, 2016). Published research about food emphasized more on risk perception and risk-benefit perception with consumers. (Frewer, 2014) On the other hand, there are some reviews and articles concluded that generally benefit perceptions are more influential than the risk counterpart in general (Bearth& Siegrist, 2016). For instance, the study from Bruhn (1975) showed that when benefit is described, the flavour ratings of new technology involved products increase. And flavour is the top consideration for consumers during food product choice process. Harinck (2007) concluded that compared with loss, gains loom more readily accepted without further thinking if sufficient and correct benefit communication is available. Research about benefit perception is relatively lacking of. The possibility that benefit perception plays a dominant role in consumers' attitude formation process has not been investigated thoroughly. This paper will focus more on the benefit perception.

Goal would be brought to this paper for the discussion about consumer acceptance, namely attitudes. Two most central constructs within social psychology are goals and attitudes. However, the nature of relationship between them received less interest than each construct individually (Ferguson & Porter, 2009). Hence, it is a good reason to study the relationship in this study.

To provide social scientists and marketers information about how to popularize nanotechnology achievements among end-consumers, the study about benefit perception and goal are proposed to be two most important subjects.

The subjects mentioned above result in the following research questions:

What factor can stimulate consumer to perceive benefit in attitude formation process towards nanotechnology?

How does the factor work on perception during consumers' attitude formation process towards nanotechnology?

Does benefit perception or risk perception work on consumers' attitude formation process towards nanotechnology?

Literature Review

Benefit and Risk Perception

Siegrist (2007) figured that consumers' induction to buy nanotechnology food applications might not change with benefit communicated. His finding is in line with Koster's study (2004) suggesting with sufficient benefit communication, participants still loom a low intention to consume GM food. Although consumers may perceive benefit from an application of a new technology, it did not generate willingness to pay, which actually can represent levels of acceptance. However, the studies above have not mentioned the types of benefit perceived by participants. Benefit perception and risk perception can be divided specifically into four types of perception: personal benefit perception, societal benefit perception, personal risk perception and societal risk perception.

Societal benefit and personal benefit which might bring effect on acceptance can be an interesting classification of benefit. Consumers are likely to perceive societal benefit from different perspectives, which could be economic benefit, environment benefit or labor efficient benefit, etc. associated to a specific technology. These benefits can be regarded as societal benefit. Decreasing environmental pollution is a case of environment benefit of a novel technology (Kang, Guo & You, 2015). Societal benefit figures perceived benefit involved by the whole society, not for any specific individual. In this sense, personal benefit perception can be regarded as the perception that pays attention on benefit particularly for one individual himself/herself. For instance, the healthiness intake from food for human's body brings healthy personal benefit to individuals for their own sake.

While consumers make decisions to use sustainable products, their behavior show similarities as what for novel technology acceptance. In terms of sustainable behavior, there is a content often explained by social dilemma, which implies a trade-off between immediate personal benefits and delayed collective benefits. Most consumers claim they consider important and desirable for sustainability issues but this does not translate into sustainable consumer behavior (van Dam & Fischer, 2015). Consumers give up the sustainable behavior when they perceive more benefits for personal than delayed collective benefits with the replaced action. This group of consumers are not willing to trade-off their own sake for vague collective benefit in future, even if they consider sustainability issues is good. In the sense, personal benefit can be seen as an important determinant for consumers' behavior.

The nature of the application determines attitude towards the use of GM. The perceived personal benefit is related to all observed differences in attitude formation. It showed the stronger positive effect on acceptance of the GM application comes from the greater perceived personal benefit (Schenk et al, 2008). In a meta-analysis, the authors concluded "A-product-related, personal benefit might carry more weight in people's acceptance than process-related, economic benefits for society at a large" (Bearth & Siegrist, 2016). For example, some European consumers are concerned about GM-food particularly. Because food is recognized more to be specific and personally benefits relevant for consumers; Consumers showed that the benefits associated with GM to producers or industry militates against consumer acceptance (Schenk, et al 2011). Apple allergic consumers show higher increasing effect on acceptance of hypoallergenic (allergy reduction) GM apples, compared to consumers who do not suffer apple allergy. (Schenk, et al 2011)

To recap, Consumer's acceptance is more stimulated by personal benefit perception than societal benefit one. Both personal benefit perception and societal benefit perception increase consumers' acceptance towards a new technology. But the personal one bring more weight on acceptance. In other words, personal benefit perception makes more differences on acceptance in this manner.

The effect of risk perception cannot be neglected as well. When it comes to food consumption choices, consumers tend to base their decisions on both risks and benefits information (van Dijk, Fischer & Frewer, 2011). Likewise, consumers are likely to be affected by both risks and benefits information associated with nanotechnology (Fischer,et al, 2013). Usually, consumers choose to absorb negative as well as positive information about one object while building perception.

Risk perception can be divided into personal risk perception and societal risk perception. Personal risk perception implies risk individuals perceived involving themselves such as the injury to the individual and the likelihood of the injury. Society risk is to measure risk to groups of people. It is resulted from societal scale problem such as ecological pollution. Societal risk perception has been expressed as frequent distribution of multiple casualty events (Pitblado,et al., 2012).

It is found in previous study that consumers are unable to perceive risk and benefit completely separately (Finucane, 2000). Perception of risk and benefit are demonstrated to be inversely related. Technologies with high risk perception by consumers will have low benefit perception, and vice versa (Alhakami & Slovic,1994). It means increasing one perception reduce the other one. In 1998, Frewer figured to increase perceptions of benefit works better than heighten perceptions of safety for technologies which are perceived high risky. It indicated that to increase benefit perception can compensate the negative influence of risk perception since the risk perception would decrease as long as benefit perception grows.

In this sense, the growing of benefit perception will relief the increasing of risk perception. It is suggested that risk regulators need to make sure risk communication of food products is relevant and salient to the public themselves, through identifying and focusing on actual concerns of public. Experts tend to look at "the bigger picture" than consumers. Consumers mostly consider personal risks than experts. For example, experts might tend to be concerned about societal risk about ecological pollution. And consumers have more careful eyes on food safety. In a study about food additives, colors are perceived slightly more unfavorable than sweeteners. The researcher reasoned that colors are more beneficial for the manufacturer who want to sell easier with better visually attractive foods. But for sweetened foods, it incorporates benefit for end-consumers by reducing caloric content but maintaining good flavor (Miles & Frewer, 2001).

Some researchers considered consumers can perceive risk or benefit independently. Consumers come across risks or benefits simultaneously. During the introduction process of a novel technology, perceived acceptable risk as well as benefit provided to the end-user will be contingent (Frewer, et al., 2011).

The other point of view figures risk perception and benefit perception are related and compensate each other. Starr (1969) derived some "laws of acceptable risk" quite many years ago. One of them is the public seems more unwilling to tolerant involuntary activities such as food preservatives. But they are willing to accept relatively higher risks from voluntary activities such as skiing. The level of tolerated risk for voluntarily hazards is even similar to the level of risk from disease. People have high tolerance of voluntary activities because they

perceived more happiness and satisfaction which indicates personal benefit perception. If desirable and tangible consumer benefits is failed to deliver, it would lead to at least public indifference to the technology and its applications. In order to make consumer acceptance possible, perceived benefits must outweigh perceive risks (Frewer, Fischer & van Trijp, 2011). In this manner, risk and benefit perception are both activated always and closely linked.

To recap, four types of perception will be investigated in the study: Personal benefit perception, societal benefit perception, personal risk perception and societal risk perception. The effect of each perception on acceptance stimulated by the material discuss in the next part would be tested in methodology part.

The Importance of Goal

To make the perception more relate to personal, "Goal" is brought into the study about attitude formation process. Human interact with their environment through commonly used goal-directed movements. If attention is involved away from the movement goal, there will be a cost to reach performance. Human spent most of their effort in central vision and central search task. If corresponding action targets far from central task, the central search task would have fewer good response (Long & Ma-Wyatt, 2014). It cost less to pay attention to object which match human's central task, the goal. Allocation of Attention resources shows preference, which preferentially engages in movement goal during attitude forming. A desired goal resulted to behavior changes. The mental representation of goals can generate behavior while people are unconscious of the reason of this activity (Dik & Aarts, 2007). To recap, according to human's nature, people tend to make behaviors which match their goal, which gain more attention with less cost.

An exploratory study about older adults' benefit perception of Internet by Melenhorst and Bouwhuis (2004) suggested goal is the primary factor brings personal benefit perception. Experience and goal were assumed to affect participants' appreciation of internet comparing with traditional communication methods. The study concluded experience has no significant effect. In contrast, the communication goal is found to determine elder adults to go online. The reason why the participants who have no interest in internet is that internet had absolutely no use for the group. They prefer to express love by slow instead of convenient email. In this case, application of a novel technology would be preferred only when it match end-consumers' personal goal.

Researchers have suggested different kinds of goals differ from behavioral and affective consequences (Deci, & Ryan, 2000). Goal can be separated into "selfish" goals or "humanitarian" goal. A goal of an individual can be beneficial for himself/herself or for others and the society. Hull (1943) figured a set of innate physiological needs that push organism to translate its primary needs to behavior in the environment which relevant to the condition. For instance, food, water and sex belong to physiological needs. Organism ought to be satisfied by action translated from physiological needs. In this sense, in food domain, goal is used to translate needs of organism for an individual himself/herself to action. A "selfish" goal is more common for food domain.

Generally, a big majority of people consume food involving intrinsic goals rather than extrinsic goals. Intrinsic goals include goals of affiliation, community contribution and personal growth.

Extrinsic goals involve goals of wealth, fame and image attainment. The second one emphasize pursuing external approval and signs of worth (Grant & Gelety, 2009). Kasser and Ryan (1996) suggested pursuit and attainment of intrinsic aspirations associated with more well-being compared with extrinsic aspirations. Since people tend to show more autonomous in pursuing intrinsic aspirations while being more controlled in pursuit of extrinsic aspirations. Further, once basic intrinsic life goals associated with enhanced well-being is above a level, it appears that the attainment of extrinsic life goals have little effect on well-being. It is found by Sheldon and colleagues (2004) that anticipated happiness in pursuit of intrinsic future goals is reported the highest levels.

In a word, both "selfish" and "humanitarian" goals are possible to be shown up by individual. The difference is which one takes the upper hand in food domain for individuals. And this would be tested in survey.

Goal, which is the essence of all that what and when we think of as a human, is to direct how we think and act in purpose. It seems hard to have consensus on the definition of a "goal". But there is one common theme across definitions, "goals reflect the end points toward which behavior is directed" (Ferguson & Porter, 2009). Goals "direct, energies, and sustain purposeful behavior over time." Action has purpose because the vast majority of meaningful human behavior is willed. Moskowitz and Grant figured all of our thoughts, belief, desires, and fears are expected to be translated into action through goals. "The occurrence of goal-directed processes is perhaps the most characteristic feature of the world of living organisms." stressed by Ernst Mayr (1976), an evolutionary theorist. Goal pursuits are the proxy of genes and executive process of brain (Bargh & Huang, 2009). Fewrguson and Porter (2009) describe goal "People transform the world around them in a way that facilitates their goals and needs rapidly and effortlessly."

People pursue something activated by desirability and it becomes needs as a result. Needs come from positive affect that generate desirability. Incentive theory proposes incentive for which the organism work is affected by stimuli or states associated with positive affect. If a neutral specific behavioral state associates with positive affect, it becomes a desired state or goal, for which organism will exhibit enhanced incentive to accomplish it (Custers, 2009). Comparing with a neutral control condition, participants increased motivation to attain the originally neutral states when the states were linked to positive affect (Custers&Aarts,2005).

Aart and colleagues (Aart, Gollwitzer, Hassin, 2004)'s finding suggested people pursue primed goals when it is desirable, because of their needs. People have implicit memory effect in which exposure to one stimulus in the past and it influences their response to new stimulus, which is called priming. People do not pursue anything that is simply primed. Subjective desirability of the goal moderated goal-priming effects. Custers stressed that "Only when a primed state preexist as a desired state associated with positive affect does goal priming induce motivational behavior (Custers, 2009). In this manner, positive affect generates desirability and brings needs to people at the end.

On the other hand, goals bring positive effect on people's mind. The editor of < The Psychology of Goals > claimed in the introduction part that "When people are asked to engage in intensive deliberation of whether to turn an important personal wish or desire into a goal, a cognitive orientation with the following features originates: people are more open-minded when

processing information; people process desirability-related information more effectively than implementation-related information."

The initiation of action ought to be considered in terms of implementing a goal. Action initiation is something focused and less distracted by irrelevant information (Moskowitz & Grant, 2009). Consumers make choice to receive information which is able to catch their attention. Shah Hall and Leander argued resources are allocated to a particular goal at a particular point among multiple goal pursuits, depending on features of a particular "motivational moment".

Action should be made to fulfill people's needs. Goals are the connection between the wants/needs of people and the action which applied to fulfill these wants and needs. Without the satisfaction of needs and wants, people were believed to experience a tension state. People satisfy needs and wants by attained goals with specific action (Moskowitz & Grant, 2009). The environment and context may provide resource for human to fulfill needs and wants for both physical and mental life. But people still need to generate action under certain environment and context. As a result, goals become an important connection.

Only a goal is not sufficient for generating action. According to cognitive psychology, information is selective to be received. This is the stimulation of information processing process (McLeod, 2008). Behaviors and memories related to the goal which is active would be more accessible and more positive while tons of interconnected and related memories loom and fluctuate in accessibility (Ferguson & Porter, 2009). Those goal-related memories are associated to goal strongly. When a goal is activated, it influences our evaluation on the stimuli which is relate to goal in our environment. Take a simple example, when you feel thirsty, you will be more sensitive to the word "water" and "drinking" (Ferguson & Bargn, 2004).

Goals cannot always produce behavior. But behavior always roots from goals. It cannot be neglected that goals liaison people to situation during the procedure they are trying to satisfy wants and needs by action. One of the connections is through specifying feasibility (Moskowitz & Grant, 2009). Heider (1958) stated of the concept "can". Person and the situation determine the feasibility of attaining a goal, not a single one can be omitted. He figured feasibility involve both whether the person has efficacy to do and the situation affording opportunity for personal to do. The strongest possibility of achieving the goal can bring more preference of this specific goal. As it shows stronger feasibility for person of action in a certain situation. In this sense, when the stimuli match consumer's goal, it becomes an "easier" and more feasible information selected by people.

Moreover, there is an atmosphere cannot be denied humans have nature to inference. People spontaneously engage in goal inference processes. Inference of others' goals offers us meaning about why other act the way they do. By doing this, what we saw is defined and we can predict what will probably happen next. We make vertical predictions about situation by knowing other's goal. Without realization about our own goal and unconscious aims, we can still infer about the others' (Moskowitz & Grant, 2009).

People's goal can become other individuals' goal by goal contagion. And this is actually an interest point for marketers, which is one of the sides that bring practical significance of goal study in this paper. There are possibilities that a goal for which shareholders desire can be a shared goal of end-consumers by goal contagion through well induction and guidance. Some research demonstrates that people infer and absorb goals perceived from others' behavior without conscious intent, which is a phenomenon termed goal contagion (Dik & Aarts, 2007).

Conjectured by goal contagion, goal-directed activity might pass on from individual to the others during societal interaction (Dik & Aarts, 2007). The authors referred other researchers in 90s implied "perceiving what others try to achieve may have important implications for one's own behavior." For instance, it has been claimed "humans and great apes can use others' goals to represent, organize and guide their own courses of goal-directed actions." It is helpful for individual to pursue the same goal as the other when the other's goal proved to have a positive and desired state to oneself. The person act in a similar motivational and goal-directed manner as the one he/she interacted with. The rationale behind is that individuals tell the others to act on a goal that is worthwhile to strive for and may be deserved to pursuit (Dik, G & Aarts, 2007). Unawareness and learning from others' goal are two essential content for goal contagion.

Matching Goals and Product Perception

Commonly, the goal itself, the motivational orientation toward the goal and the manner or means of goal pursuit are three major elements in pursuit of goal. The relation between motivation orientation and manner of goal pursuit were paid less attention by psychologists and scientist while the relation between the goal and motivational orientation was made more progress on (Higgins, 2009). To study the match relation between goals and product perception is actually a study of motivation orientation and manner of goal pursuit.

A match indicates implicitly a success at a goal for people. It means that people tend to view certain successful goal-related means and action as desirable, which is preferred to approach as soon as the goal is activated (Ferguson & Porter, 2009).

Higgins described Regulatory Fit Theory (2009) "People experience regulatory fit when the manner of their engagement in an activity sustains their current regulatory." People "feel right" about what they are doing with the "fit" and engage more strongly. This is regulatory experience produced by goal pursuit with regulatory fit. "Feeling right" mediate regulatory fit toward persuasion. In fit conditions, for example, accomplishment and gain, safety and non-loss, message was more persuasive than that in the non-fit conditions, for instance, accomplishment and non-loss, safety and gain. The fit here is regulatory fit, which involve participants pursuing or imagining pursuing a goal in a particular manner that fits or does not fit their orientation toward the goal. In this sense, fit is actually "match".

Goals differ from feasibility of being attained by action (Moskowitz & Grant, 2009). The mind tend to choose goals that shows more feasibilities and then practice them as action. The match between goal and object is a condition helps people to translate motivation into a manner while it provides more feasibilities.

If a match between goal and application is reached, consumers would perceive stronger feasibility to attain goal by the application in this situation. They do not need to spend too much effort. They can just choose the product fit their goals in a shortest routine. The application which match their goal is the one provides an ideal situation for them to reach goal. As a result, consumers tend to show positive attitude towards the product, which help them reach the end, the goal.

A match between consumers' goal and product is a very strong connection to be remembered. And it shows high feasibility of fulfilling a goal, which motivate individuals to generate action. The levels of processing model labeled by Craik and Lockhart (1972) and schema theory are

consistent that “The more connections to a single idea or concept, the more likely it is to be remembered.” New information need connections to be noticed and then to be remembered. The connection between objects and consumer their own sake is quite a strong one. To a large degree, people care about the stuff relate to themselves, which interest themselves.

The dominant view in western world with foundations from Aristotle and St. Thomas Aquinas, through Thomas Hobbes and Jeremy Bentham, to Friedrich Nietzsche and Sigmund Freud, has claimed for long, we are exclusively self-interested at heart. Egoism, as the majority in western philosophy and psychology, argued no matter how noble the behavior we do shows to benefit others. It is actually directed toward the goal of self-benefit ultimately. Altruism did not deny this argument for motivation of much of what we do. Some acts like hero sacrifice in the war are actually ultimately motivated by some form of self-benefit (horned and feeling of awarded). It sounds cynical but reasonable by egoism. Almost all of current ideas about individual psychology, social relations, economics, and politics are explicitly or implicitly agree with egoism. Including everything we do to benefit others, we make any action done for our own benefit ultimately (Batson, 2014).

Consumers may have existing knowledge about nanotechnology or novel technology, the information based on the match is able to attractive their attention. And then enter their brain to become “new knowledge”. If a match is established between initiator and existing knowledge, new information can be accepted. Bartlett put forward memory is inaccurate and this inaccurate is systematic. A study in 2003 figured that inaccurate but systematic memory implies knowledge is retained, manipulated and changed as new knowledge is acquired. (Lutz & Huitt, 2003) This is in line with bottom-up information processing system, which predicated brain attempts to match initiator and new information with existing concepts (e.g., Gibson, 1979). In this system, characteristic of incoming information rather than a whole idea is judged. Consumers might have a whole idea about a technology, but brain is still free for noticing characteristics of specific application of nanotechnology. If the characteristics in line with consumers’ own sake, they become interesting to be noticed. When the information about characteristic of specific application exposed matches consumers’ goal, it is chosen to be “interesting information” noticed by brain, to be new knowledge.

The match between goal and application is supposed to increase acceptance of the technology through risk/benefit perception, especially benefit perception. To some degree, people have myopia toward risk when an application match their personal goal well. Frewer (1998) figured larger obvious risk such as from medical treatment are acceptable when individuals’ desirability of the resulting benefits of application is pressing. A study in Iran specifically on nanotechnology indicated the participants saw highly development potential of the nanotechnology applications since the technology matches their own expectation of medical treatment. More than 74% respondents selected medical products as most promising application of nanotechnology, especially in the field of cancer therapy (Rahimpour, 2012). The underlying cause behind is that nanotechnology is one of the unique and irreplaceable choices for this field. The risk perception is relatively unimportant while benefit perception is taking the upper hand.

The reason why nanotechnology application instead of nanotechnology is studied in the paper is consumers normally tend to generate perception towards specific application than a general content of a technology. As specific application is more concrete and accessible in life. A general content of a technology requires more cognition thinking process that people consciously go through in purpose.

Perception of a same technology varies from different application domain. Besides, inside one same application domain, there are many different specific application forms. The need of consumers utilizing different application domain should be fulfilled by distinguished approaches as they have different trajectories. Consumers may not connect a general technology with their own goal but they would do that for specific application of a technology (Rahimpour et al., 2012；van Dijk et al., 2015).

Societal acceptance shows differences among technologies as well as among domains of which application of the technology (Steenis& Fischer, 2016). Published researches have not focused on specific applications in one same application domain. It is well known that genetic modification was categorically rejected within the food domain but in the meanwhile received broader acceptance in medicine in the UK (Frewer, 2003, 1990). Similarly, the urgency and unique potential of nanotechnology medicine application makes it preferred within this domain. And for food, as the lack of urgency for food nanotechnology applying as well as the higher level of uncertainty about risk perception for consumers brought more unlikeable concern towards this application domain (Siegrist et al., 2007, 2008; Gupta et al., 2015; van Dijk et al., 2015; Rahimpour et al., 2012). In a word, the result of acceptance study would vary among domains.

Likewise, for perceptions of potential benefits and risks, stakeholders show differences between applications. Risk and benefit perceptions differ from specific domain associated with applications. Generally, food applications are more likely to be associated with fewer benefits and more risks, while more beneficial and less risky are perceived for medicine, clean water and energy application of nanotechnology. Especially for medicine application, not only public response but also experts score it opposite to food on high urgency, little uncertainty and higher uncertainty tolerance. Experts state that they figure the urgent need for medicine application due to the uniqueness of nanotechnology potential (van Dijk, et al 2015). This is in line with the study from Priest and Greenhalgh (2011), they reported participants expected most future benefits in the areas of medical advances, instead of in other fields of application such as agriculture food production. Public's opinions and acceptance depend on the specific domain of nanotechnology applications by studies in the United Kingdom (van Giesen Fischer, & van Trijp, 2016).

The results from studies of various countries can be understood easily by an example of an assumption. If a cancer patient is told nanotechnology involved medicine or therapy might work for his/her condition, the patient, who is under the high urgency to fulfill his/need to gain health, would be willing to have a try even if he/she is uncertain of the risk or consequence of the new technology application. Since the application may be a unique choice to match his/her specific goal: recover from serious disease. But for normal customers, who do not have specific need for food characteristics, they cannot find out the reason to choose a product with uncertainty when they have much more alternative options, which can reach the same goal of food consuming.

To recap, application of nanotechnology will be investigated rather than the technology. As the purpose of the paper is to answer the question about how to increase public acceptance of nanotechnology, instead of arguing which application domain has more market potential. Moreover, different application domains of nanotechnology might vary from perception trajectories in details. Thus, it should be one application domain selected for the study. Food domain is the target for this study.

Opportunity for Nanotechnology

Missing emphasis on practical perspective of a technology might decrease the possibilities of public acceptance and consumer acceptance. Technological innovation is supposed to deliver specific benefits satisfy consumers and stakeholders. Technology differs from science. It is not necessary for science to answer the question about what a science domain can be used for too straightforward. Technology is expected to benefit people in a more "straightforward" way. However, in recent society, no all technologies identified the features or characteristics which may lead to acceptance before commercialization of the product or contained into the product design and development (Gupta, et al. 2014).

It is arguable to predict that attitudes toward nanotechnology are probably to begin forming in the near future and will be formed by direct experience with technology applications (Gupta, et al. 2014). It is the moment nanotechnology has opportunities to communicate relatively fair with consumers' need and goal.

Consumers embrace their own goals to encounter specific applications of a novel technology. The relation between goal and application is the stimulation which initiate benefit perception and risk perception for consumers.

It is assumed in this paper that when goal match with application, both societal benefit perception and personal benefit perception of nanotechnology will increase, but largely for the personal benefit one. Getting insights from egoism, when there is a match between goal and application, the effect of benefit perception on acceptance of nanotechnology will strengthen, especially through personal benefit perception trajectory. Personal benefit perception would make biggest effect on acceptance. The goals of an application come from consumers themselves. They set their goal or hold the goal unconsciously for their own benefit. Hence, as soon as their goal is fulfilled by the application, they will tend to perceive their personal benefit more than societal benefit. And it is the same trajectory for risk perception. When the goal mismatch application, both societal and personal ones will be decrease but largely reflected in personal risk perception.

Hereby, three hypothesis of the paper which will be investigated is put forward.

Hypothesis 1a: When personal goal match with nanotechnology application, it increases consumers' benefit perception.

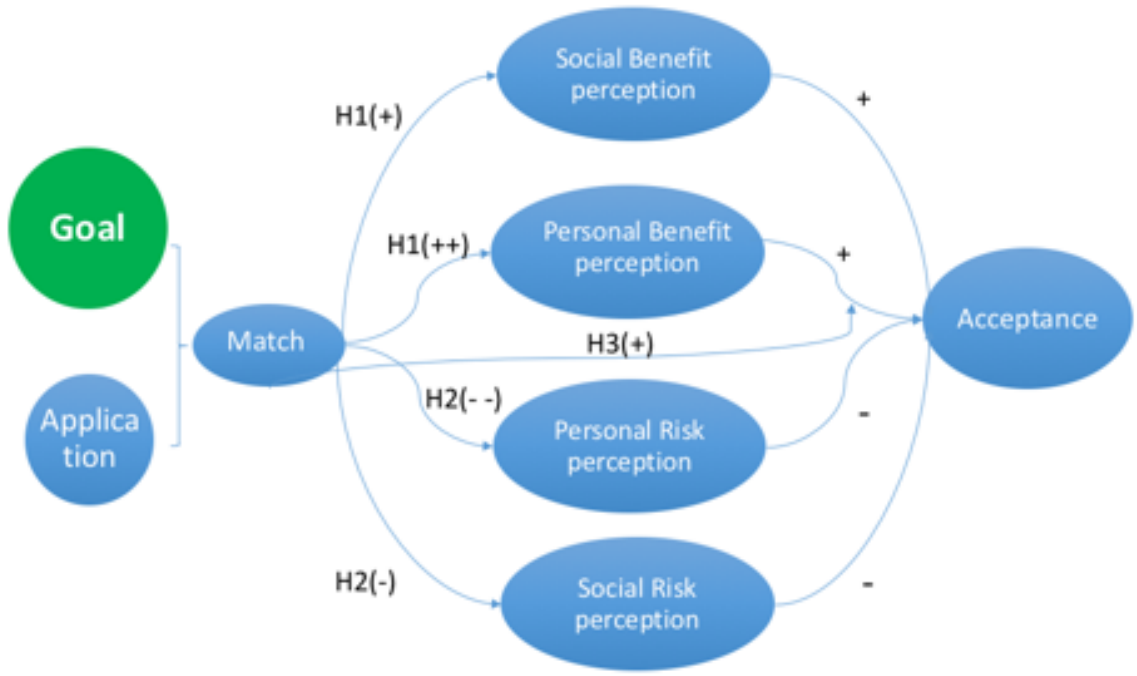
Hypothesis 1b: The increase will be larger of personal benefit perception than of societal benefit perception.

Hypothesis 2a : When personal goal match with nanotechnology application, it decrease consumers' risk perception.

Hypothesis 2b : The decrease will be larger of personal risk perception than of societal risk perception.

Hypothesis 3: When goal and nanotechnology application match, it will increase the weight of benefit perception on acceptance, especially through personal benefit perception.

Conceptual Framework



Method

Sample

Nanotechnology applications target at all potential consumers in society. The subject of this paper involves the public. There is not a target group of the paper. Therefore, random sampling was selected as sampling technique and convenient sample as sample method. In general, residents in the Netherland are selected as sample. The sample is expected to be assessed for the study coming down to 155 but 108 were completed and used for the study at the end. The survey was carried out by questionnaire from Jan.5 to 18, 2017, taking 13 days. Participants opted into the study was conducted online by Qualtrics.

Socio-demographic information of participants is recorded including gender, age, education level and nationality. For the age group, 18~25 implies university adult, 26~30 indicates graduated young adult, 31~40 represents young family and 41~65 for middle age adult, above 65 for old age.

Materials

Goal

Food domain of nanotechnology were chosen for the study. As comparing with the other two major nanotechnology application domain: medicine and energy, food and agriculture products are more easily assessed by end-consumer. Normally end-consumers have more experience and knowledge about food domain relatively.

The authors of <The Psychology of Goals> claimed in the introduction chapter of the book "We do not know we are using certain rules/procedures in pursuing our goal, but also we do not even know we are pursuing a goal at all." Large amounts of our goals in brain are not noticed and maintain unconscious, not only deserts the process, but also the goal existence. It is normal that we are not aware of either our goals and what we do to pursue all goals truly exist in the brain (Moskowitz & Grant, 2009). Thus, goals cannot be asked directly by descriptive words. For instance, if participants were asked to select one word describe their expectation for food consumed daily best from three descriptive words: Nutrient; Flavor; Safe. The word participant selected is supposed to represent his/her goal for food product generally. However, this is the procedure forces consumers to make inference and conclusion for goal while most of our goals in life stay unconscious. Instead, it is preferable to offer various description about one same product variety but with different features, which used for inducing participants to select what characteristics of food products they care about most. What participants care about most actually is their goal of food, without awareness by asking. In this manner, goal is detected by induction under unconscious.

Participants should be given freedom to choose personal goals as well as goals benefit society. Thus, two products represent personal goals: Flavor and Nutrient. The other two represent environmental friendly and fair trade belong to societal goals. Cookie is selected as the food category for all four products in case participants have preference on a specific category of food product.

The description of four cookie products in questionnaire is: Cookie with very nice flavor, ranked as the best taste by a Dutch market survey; Cookie with more nutrient elements needed by human body, proved by scientific association; Cookie produced by an energy-saving system, which is more environmental friendly; Cookie produced by fair trade, which bring more benefit for workers in developing countries

Application

Chocolate milkshake benefit from nanotechnology is taken as the one product category. Four types of chocolate milkshake drink with different functions brought from technology are considered to be nanotechnology applications. Participants' perception would be tested based on the applications.

Descriptions about the four products were checked by a nanotechnology Ph.D. candidate from Nanjing University, China. Product one used an advanced form of cocoa to enhance flavor without adding excess sugar; Colloids of zinc nanoparticles carrying by product two, a milkshake drink enhances uptake and/or target delivery of zinc while milk is considered to perform poorly on zinc uptake and distribution; Product three accounts for environmental friendly concern. Bad bacteria could be detected on milk carton to indicate the product is not safe to drink anymore with flexible, color-changing nano-based ingredients (Buzby, 2010). This application can decrease food waste since consumers throw away product when they exceed expiry date while sometime food is still safe to eat not long after expiry date; Product four stands for the fair trade goal: The cacao for the chocolate milkshake drink is produced by a Dutch company that invests cacao beans farms in Congo (an African country), with technology support from Netherland, such as nano pesticides for plant protection and production (The dispersion and gettability of agricultural formulations of can be increased by Nano pesticides), provides over 100 employments for local farmers, who are vulnerable and hard to survive. The description above will be revised to be understood by lay people easily in questionnaire.

A pilot test is arranged with sample size of 10 participants, which is used to pre-test whether the product represent these four goals respectively as the researcher proposed.

Perception

There are four types of perception in the model: personal benefit perception, societal benefit perception, personal risk perception and societal risk perception. Personal benefit perception indicates the benefit perceived relate to individuals themselves; Societal benefit perception implies perceived benefit on societal-scale such as economic value for industry and environmental-friendly concern for environment; Personal risk perception indicates the risk participant perceive involving themselves such as dread and tolerance of uncertainty; Societal risk perception implies perceived risk brought from the application to societal scale problem such as ecological pollution.

Perception is test by 7 scales indicating how much participant agree with the statement from "very much" scale 1 to "not at all" scale 7. Each perception is tested by three questions and the average scores of three are calculated to be result.
The statement would be the combination of four elements: Benefit, Risk, Personal and Society, which would be: The product is benefit/risky for me/society; The product adds more benefits/is

riskier than conventional one for me/society; The product brings additional benefits/risks to me/society.

The perception scale is based on application which allocated to participant. Every participant ought to only scale perceptions for one application. Thus, both match and mismatch occasions happened from different participants randomly.

Acceptance

Willingness to pay is the indicator to test participant's acceptance about the nanotechnology application. Some previous researches showed that people are not willing to pay GM or nanotechnology product even though they have perceived specific benefit involved in the applications (Yue, 2015). Hence, willing to pay is selected to test acceptance, in order to test significant effect from the match condition and personal benefit perception, which is supposed to play an important role by the study.

Participants were asked to decide the price that they are willing to pay for the product they are allocated.

Procedure

Following an introduction part with welcoming words, participants were asked to choose one cookie product which represents one goal. Participants may have other goals of food rather than these four options. However, the four perspectives were selected randomly for the manipulation of match condition between goal and nanotechnology application. The content of consumer' food goals is not the object of the study so not all relevant goals are included in the study. But participants are free to choose from two goal types: personal goal benefits individuals and societal goal benefits others and society. The goal selected by participant is the one they most prefer comparing with the other three of which they can choose in the study.

There are four applications described in the survey but each participant was only allocated one application to test willingness to pay and four types of perception in case of fatigue and carryover effect. Every application has its corresponding goal. As a result, some participants evaluate application match their goals but the others not. The match condition will be manipulated in programming process during data analysis.

Follow up, acceptance was tested by willingness to pay that regarded as an indicator of acceptance based on the application which was allocated to participant in former step. This is the action forces participant to judge the nanotechnology application that they are allocated with limited information and thinking material. Consumers were asked to drag the bar indicating the price they are willing to pay under description of three products separately. The average market price of a mini size chocolate milkshake drink is $2.99 (Fast food menu, 2016), about 2.8 euro. 2.8 euro is taken as the starting point for the price participants are willing to pay for the product. Participants can choose to pay for the product from 0 euro to 10 euro by dragging the bar.
The crucial next testing indicator, four types of perception, is used to test its effect on acceptance and attitude formation. Three questions are asked for each perception. Participants

were asked to answer 12 questions about perception in total. They are asked to select scale from 1 (Very much) to 7 (Not at all) for each questions.

Background information were asked in the end of questionnaire and it is used as socio-demographic information for researcher.

Pilot Test and Participants

A pilot test about whether the four applications indicate corresponding goals was conducted on 10 participants. The description of applications (chocolate milkshake drink) was sent to participants and they are asked to name each application with a goal by flavor, nutrient, environmental friendly and fair-trade. Two participants mixed flavor application and the nutrient as first reaction. They mentioned "sugar" reminded them of nutrient on first eye; Two participants reported they felt doubting while choosing between environmental friendly and fair-trade applications because the description seems to embrace both two concerns; In general, most participants showed same understanding as the researcher. At the end, the description was revised slightly according to feedback.

188 participants were recorded and 108 data were used. Over 50% of the sample aged between 18 and 25; Around 70% of participants have master and equivalents or above education background; All participants live in Netherland or have ever lived in Netherland for relatively long time period. In terms of nationality, 35% come from China, 23% are Dutch, 34% are from European countries including Holland, 15% of the sample are Asian except for Chinese and there are 7 Americans participants and 2 Africans. Few participants missed to report nationalities.

Programming

In case of participant's fatigue and carryover effect, each participant was allocated one application among four. Hence, the total scores of four perceptions is calculated by the sum of four conditions belonging to each perception. The same for the score of willingness to pay; Each perception was designed to be tested by three equivalent questions, which showed scale reliability, and all the alpha were high (Flavor application alpha 0.89; Environmental friendly application alpha 0.93; Nutrition application alpha 0.94; Fair trade application alpha 0.97). It implied every three questions are able to measure the same variable for the perception; The mean of three questions of perceptions were calculated. The scores of personal benefit perception, social benefit perception, personal risk perception and social risk perception were required from the mean of three equivalent questions.

Dummy variables are used to indicate match and non-match condition. The condition that participants were allocated with application match the goal they selected in the previous question is coded 1 and those who allocated application did not match the goal is coded 0.

Descriptive Details

Food is the domain of application in this study. Participants indicated goals by selecting a cookie product. There are four cookie products for participants to select. Two of them account for personal goals and the other two for social goals. Personal goals are those obviously benefit individuals themselves. Social goals add more value to the environment and the society. 70% of participants selected products standing for personal goals while the goal has not asked

directly in order to prevent their conscious cognition about their goals. To some degree, it implies that on food domain, people tend to select products that benefit themselves.

Knowing the average market price of regular chocolate milkshake drink is 2.8 euro, as the mean table shows, participants are willing to pay a higher price for all four applications adding extra "function" by nanotechnology. Setting 2.8 as testing value, to run one-sample t-test for willingness to pay and the result comes out as t (92) =3.96, p<0.00. Hence, the total mean of the price (3.19 euro) participants are willing to pay for the chocolate milkshake is significant. (Table.1) Specifically, participants were allocated with the chocolate milkshake which adds extra taste are willing to pay the highest price: 3.44 euro. The other chocolate milkshake also stands for personal goal (nutrition) got the price of 3.19 euro. The price for the product which defer to fair-trade idea is 3.10 euro. And for the environmental friendly product is recorded to be 3.06 euro by mean table. To recap, participants are willing to pay a higher price for the personal goal ones. Moreover, they showed higher acceptance towards the applications fit personal benefit more than the social-benefit one.

Table. 1 Means of Willing to Pay and Perception

Nanotechnology Application		Willing to Pay (Euro)	Personal Benefit Perception	Societal Benefit Perception	Personal Risk Perception	Societal Risk Perception
Flavor	Mean	3.44	3.19	3.34	5.14	5.14
	Std. Deviation	1.40	1.39	1.20	1.61	1.62
	N	20	19	19	19	18
Environment	Mean	3.06	4.15	3.65	4.64	4.67
	Std. Deviation	.60	1.37	1.18	1.51	1.64
	N	24	25	23	24	23
Nutrition	Mean	3.19	3.99	4.12	4.67	4.42
	Std. Deviation	.84	1.21	1.51	1.66	1.55
	N	23	23	22	23	22
Fair Trade	Mean	3.10	4.19	3.24	4.89	4.94
	Std. Deviation	.86	1.22	1.63	1.57	1.68
	N	25	25	24	24	24
Total	Mean	3.19	3.92	3.59	4.82	4.78
	Std. Deviation	.94	1.33	1.42	1.57	1.62
	N	92	92	88	90	87

Perception was tested by 7 scales: 1 'Completely agree' 2 'Agree' 3 'Somewhat agree' 4 'Neutral' 5 'Somewhat disagree' 6 'Disagree' 7 'Completely disagree'. To look at table 1. The application adds value of good flavor (Flavor) stood out from the other three applications. The means showed it gained the highest benefit perception and lowest risk perception in general. Specifically, the flavor application ranked second for societal benefit perception (3.34), only 0.10 lower than the fair-trade application. And it is the only application that participants thought "somewhat disagree" the statement "The application is risky to me" while the other three applications were selected "neutral".

4 is the median of scale 1 to 7, to look at the mean of four types of perception, personal risk perception keeps a farthest distance from 4. It means participants perceive low personal risk of nanotechnology applications.

To look at the total means, 4 implies “neutral”, the strongest degree depends on the slot from 3 for benefit perception and 5 for risk perception (the lower score means higher benefit perception and higher score means lower risk perception). In this manner, participants showed the strongest societal benefit perception on nanotechnology application (3.59) than the other three perceptions (personal benefit perception:3.92; social risk perception: 4.78; personal risk perception: 4.82). Chocolate milkshake as a food product, being normally considered to benefit individuals more, was perceived stronger in social benefit, which may imply that when consumer knows the product is nanotechnology application, it makes some differences (Table 1).

Table 2. Correlations Table Perception

Correlations

		Personal Benefit Perception	Societal Benefit Perception	Personal Risk Perception	Societal Risk Perception
Personal Benefit Perception	Pearson Correlation				
	N	92			
Societal Benefit Perception	Pearson Correlation	.615			
	Sig. (2-tailed)	.000			
	N	88	88		
Personal Risk Perception	Pearson Correlation	-.244	-.300		
	Sig. (2-tailed)	.021	.005		
	N	89	86	90	
Societal Risk Perception	Pearson Correlation	-.170	-.260	.865	
	Sig. (2-tailed)	.115	.017	.000	
	N	87	84	87	87

According to the correlations test showed by table 2, two benefit perceptions and two risk perceptions both showed high correlation. Personal benefit perception and societal benefit perception, P<0.001, Pearson Correlation=0.615; Personal risk perception and societal risk perception, P<0.001, Pearson Correlation=0.865. It means participants’ personal perception and societal perception is relatively congruent. For example, participants may perceive personal benefit based on their perception on societal perception and the reverse is also true. The correlation between personal benefit perception and societal risk perception has no significance but significant effect is showed on societal benefit perception and personal risk perception. P=0.005, Pearson Correlation=-0.30. It indicates when participants perceive the applications have high benefit for the society, the risk for individuals themselves should be low or the way around. Moreover, it showed significant effect on the opposite relation between benefit perception and risk perception. (Personal benefit perception and Personal risk perception: P=0.021, Pearson Correlation=0.244; Societal benefit perception and Societal risk perception: P=0.017, Pearson Correlation=-0.260.

Table 3. Means (SD) of personal and social risks and benefits. Underlined cells indicate goal-attribute matches.

		Mean(St.Deviation)Number			
Goal	Application	Persoanl Benefit Perception	Societal Benefit Perception	Persoanl Risk Perception	Societal Risk Perception
Flavour	Flavour	**3.10 (1.32)n=13**	**3.45 (1.01) n=13**	**4.88 (1.66) n=14**	**4.94 (1.72) n=13**
	Environment	4.07 (1.61) n=9	3.89 (1.45) n=9	5.30 (1.27) n=9	5.46 (1.26) n=8
	Nutrtition	3.83 (1.53) n=6	3.50 (1.35) n=6	4.72 (1.81) n=6	4.00 (1.79) n=6
	Fair Trade	3.94 (1.32) n=9	3.19 (1.57) n=9	5.37 (1.58) n=9	5.07 (1.7) n=9
Nutrition	Flavour	3.50 (2.08) n=4	2.50 (1.00) n=4	6.11 (1.02) n=3	5.78 (1.07) n=3
	Environment	4.11 (1.05) n=6	3.53 (0.96) n=5	4.22 (1.63) n=6	4.33 (1.46) n=6
	Nutrtition	**4.17 (1.22) n=7**	**4.28 (1.14) n=6**	**5.07 (0.98) n=7**	**5.28 (0.77) n=6**
	Fair Trade	4.19 (0.72) n=7	2.43 (0.88) n=7	4.86 (1.26) n=7	4.90 (1.12) n=7
Environment	Flavour	- (na) n=0	- (na) n=0	- (na) n=0	- (na) n=0
	Environment	**3.89 (2.01) n=3**	**3.78 (1.84) n=3**	**3.67 (2.19) n=3**	**3.78 (2.91) n=3**
	Nutrtition	3.88 (1.03) n=4	3.92 (2.17) n=4	5.58 (1.89) n=4	5.33 (1.25) n=4
	Fair Trade	4.00 (1.41) n=2	2.00 (na) n=1	6.00 (na) n=1	6.00 (0) n=1
Fair Trade	Flavour	3.17 (0.71) n=2	4.33 (2.36) n=2	5.50 (2.12) n=2	5.50 (2.12) n=2
	Environment	4.42 (1.4) n=4	3.50 (0.79) n=4	4.00 (1.28) n=4	4.17 (1.67) n=4
	Nutrtition	4.42 (0.96) n=4	5.58 (1.13) n=4	2.67 (1.33) n=4	2.50 (0.58) n=4
	Fair Trade	**4.67 (1.73) n=6**	**4.28 (2.13) n=6**	**4.33 (1.94) n=6**	**4.94 (2.41) n=6**

The table is a data overview of the study in this paper. Doing a unianova analysis of all perception types by goals selected by participant in first question and all applications, a table comes out with mean of perceptions on all four types of nanotechnology application. The most left column indicates the goals participants selected before they are allocated an application to quantificat perceptions on. For instance, participants who selected flavor goal have four possibilities of allocated applications (flavor, environmental friendly, nutrition and fair trade application). There are four groups among the participants select flavor goal. Each group quantificat the perception on the application allocated. The boldface is the condition when allocated application match the goal.

The significant effect is not strong enough to interpret the match and it would be discussed more in hypothesis testing part.

Table. 4 Total Mean Table of Perception Based on Goal

Goal	Flavor	Nutrient	Environment	Fair-Trade
Persoanl Benefit Perception	3.66	3.92	3.88	4.35
Societal Benefit Perception	3.50	3.17	3.86	4.42
Persoanl Risk Perception	5.09	5.13	4.76	3.98
Societal Risk Perception	4.93	5.07	4.67	4.21

Table 4 consists data picked from table 3. Participants who selected flavor as goal perceive higher personal benefit than societal benefit and lower societal risk than personal risk on nanotechnology application; Participants who selected nutrient as goal perceive higher personal benefit than societal benefit and lower personal risk than societal risk on nanotechnology application; Participants who selected environmental friendly as goal perceive slightly higher personal benefit than societal benefit and lower personal risk than societal risk on nanotechnology application; Participants who selected fair-trade as goal perceive higher personal benefit than societal benefit and lower societal risk than personal risk on nanotechnology application.

Only take personal benefit perception into account, participants who select flavor as goal rank the first, this group of participants perceive highest personal benefit on nanotechnology application; take societal benefit perception into account, participants who select nutrient as goal rank the first, this group of participants perceive highest societal benefit on nanotechnology application; take personal risk perception into account, participants who select nutrient as goal rank the first, this group of participants perceive lowest personal risk on nanotechnology application; take societal risk perception into account, participants who select nutrient as goal rank the first, this group of participants perceive lowest societal risk on nanotechnology application.

Hypothesis Testing

Hypothesis 1a: When the goal match with nanotechnology application, it increases consumers' benefit perception.
Hypothesis 1b: The increase will be larger of personal benefit perception than of societal benefit perception.

To test H1, repeated measures Anova is used with "match" condition between goal and nanotechnology application as between factor and personal benefit perception/ societal benefit perception as within factors.

No effect of match on average benefit perception was found. F (1,86) =0.039, P=0.844. There is no significant effect of the match condition on benefit perceptions. When the goal match with nanotechnology application, it cannot increase consumers' benefit perception towards the application. Hypothesis 1a was not supported.

Two within factors (personal benefit perception and social benefit perception) have no significant effect. F (1,86) =2.231, P=0.139. Considering the match condition, it increase the effect but still cannot reach the significant level. F (1,86) =2.278. P=0.099. It implies hypothesis 1b is not supported as well. When the goal match nanotechnology application, participants did not show higher personal benefit perception than societal benefit perception.

Hypothesis 2a：When the goal match with nanotechnology application, it decrease consumers' risk perception.
Hypothesis 2b：The decrease will be larger of personal risk perception than of societal risk perception.

Similar results come out as the hypothesis 1. The significant effect is even smaller than the factors in hypothesis 1. No significant effect of match on average risk perception was found. F (1,85) =0.002, p=0.965. When the goal match with nanotechnology application, it cannot decrease consumers' risk perception towards the application. Hypothesis 2a was not supported.

Two within factors (personal risk perception and societal risk perception) have no significant effect. F (1,86) =0.006, P=0.939. Considering the match condition, it increase the effect but still cannot reach the significant level. F (1,85) =2.478. P=0.119. It implies hypothesis 2b is not supported as well.

Hypothesis 3: When goal and nanotechnology application match, it will increase the weight of benefit perception on acceptance, especially through personal benefit perception.

Hypothesis 3 was not supported. No significance effect is showed between willing to pay and the match condition which works on personal benefit perception. P=0.995. In other words, match condition and personal benefit perception is supposed to have interaction effect but this effect is not significant. The match condition cannot make differences concerning the effect of personal benefit perception on willing to pay (acceptance).

Nevertheless, a stepwise linear regression showed a significant effect of personal benefit perception on willing to pay, P=0.48 It implies that when participants perceive higher personal benefit, they are willing to pay a higher price for the product, but it was not related to match consideration.

Discussion

Participants are willing to pay a higher price for nanotechnology food application. They feel like to pay more while perceiving higher benefit perception and lower risk perception. The conclusion seems to be boring but there is one interesting point. Personal benefit perception played a most important role in individuals' decision. People are willing to pay a higher price for the food product they perceive higher benefit perception. Moreover, there is a good news that participants perceive low personal risk of nanotechnology application in general.

On the other hand, it is showed by the data whether the application of nanotechnology match participants' goal or not did not bring differences to their decision of buying. Participants permit to pay more but it is not because the application match their goals of the product.

Theoretical Implication

It is expected the match between consumers' goals and nanotechnology applications makes differences on their acceptance towards the new technology. However, the result of data showed the match did not make significant effect. The result seemed to be against common sense that "People pursuit what are able to fulfil their needs". Willingness to pay is used as the indicator to test consumer acceptance. Participants were willing to pay an average higher price for the nanotechnology applications with new functions benefit from the technology. However, it did not depend on the relation between their own goal (needs/wants/demands) and the application itself. The possible reason behind is "Life is not that simple." when the object of attitude formation is new technology. To recap, people showed positive attitude and relatively high acceptance towards nanotechnology application but it was not result from that people consider the application match their own goal.

The other hypothesis supposed personal benefit perception brings greatest effect to the match on consumers' acceptance. It was not supported by data but personal benefit perception is proved to have significant effect on willingness to pay (acceptance), while the other three types of perception did not show significant effect. It means people are willing to pay a higher price for the nanotechnology application when they perceive higher personal benefit. Moreover, supposed by the paper, personal risk perception also plays a special role. But the result showed it did not really make changes. It implies no matter the perceived personal risk is high or low, it does not bring differences on participants' willingness to pay. From literature review chapter, it is suggested that consumers can tolerant high risk of a new technology application when the perceived personal benefit is extraordinary high such as cancer treatment. In this study, nanotechnology application on food domain is not an extremely pressing field as cancer treatment. From published research, food applications are more likely to be associated with fewer benefits and more risks (van Dijk, et al 2015; Priest & Greenhalgh, 2011). In contract, in this study participants showed special concern on personal benefit perception than the risk counterpart.

Practical Implication

Nanotechnology brings various of new functions but for food product, enhancing flavor should be the emphasis. As the data showed, 41% of participants selected the cookie adds extra flavor from four cookies products which have four different extra function benefit from

nanotechnology. According to the result of this study, at least for food product, the emphasizes is flavor, which correspond to personal goal. The result in line with the insights gained from literature research chapter that "selfish" goal is more common for food domain and flavor is one of the most important focus of food product.

Personal benefit perception is the most important consideration motivate consumers to pay a higher price for products. In this sense, both product design and marketing strategy ought to stress on personal benefit gained from the product for consumers. The nanotechnology application should be able to generate an obvious perception that "the product benefits me" for consumers. Societal benefit perception, personal risk and societal risk perception are important concerns. But marketers should notice that personal benefit perception is the only one showed significant effect on willingness to pay by participants. Marketer should put personal benefit perception on the upper hand for their products.

In a general way, marketing people always propose products should match consumers' goals/ needs/wants, but in this study we found the match did not make significant on willingness to pay. Trying to match consumers' goals with the function of application seems not be vital according to the result of this study. Compared with conventional products, probably for novel technology application, to stress on fancy functions added by the technology might work, which does not need to link with consumers' existing goals in purpose.

In this study, participants had a neutral and relatively positive risk perception on nanotechnology application. Lay people do not have comprehensive ideas about the risk of nanotechnology (van Giesen, Fischer & van Trijp, 2016). If marketers proposed benefit of products to consumers, they would consider the benefits but they do not have have much cogitative load on the risk side. Marketers can consider to stress on consumers' benefit perception and manage risk perception in a good way while knowing the risk perception on nanotechnology application is not high nowadays.

Limitation and Future Research

The limitation of perception testing may effect conclusion most. The seven scales used to test perception start from 1 to 7. Scale 1 is supposed to indicate participant agrees with the statement very much and 7 disagree with the statement at all. Some participants reported that they defaulted scale 1 as disagreeing at all and 7 as agreeing very much based on their habit.

Perception is always not easy to test by survey because big majority of information were perceive unconsciously, as argued in literature review part. When people are asked about perception directly and quantificat it by precise scales, they are forced to make a "second perception" since they are expected to explain their perception. And that is not the "real perception." It is better to test perception when participants are unconscious about they are tested perception.

Moreover, the manipulation of match condition might not be very successful. Participants were asked to select a cookie product indicates their goals first and were allocated one application randomly. Participant might get an application match their goal or the opposite situation. The match condition is manipulated in programming process during data analysis. The methodology of manipulating match is proposed by researcher without references support. It might not be an optimal method to get the match condition.

Willing to pay is set as the indicator of consumer acceptance but it may be unilateral. For instance, sensory evaluation, three-way internal preference mapping and etc. can also proposed to be factors to test consumer acceptance (Nunes, Pinheiro, & Bastos, 2011; Singh-Ackbarali, & Maharaj, 2014).

In terms of composition of the sample, the big majority of participants are students aged from 18 to 25 years old. And above 70% of participants have master and equivalent education background. The group is more open to new information and more easily to understand the benefit from new technology. The group tend to attempt new stimulus without less resist. In addition to this, most of the participants come from Wageningen University. The group shows more interest in topics related to environmental friendly, sustainable development, novel food technology, etc.

Even though the data shows personal benefit perception is the only one has significant effect on willingness to pay. The data also shows considering four types of perception, participants gave societal benefit perception a highest score of the nanotechnology application (Table. 1). It means for nanotechnology food application, participants perceived high societal benefit. The reason behind has not been studied by this paper, which might be investigated in future research.

As table 2 shows and analysis discussed, participants would perceive low/high personal risk if the societal benefit perception is high/low, vice versa. In the meanwhile, there is no significant effect shown on personal benefit perception and societal risk perception. The reason behind has not been studied and it can be investigated further.

To recap, for future research, it can be to study what make personal benefit perception become the only one determine willingness to pay or to study what and why make the match condition have not significant effect on willingness to pay or perceptions. Or perhaps to test the match condition in the model of this paper again with other methodology first.

Conclusion

In general, it is a good news that consumers have a relatively positive attitude towards nanotechnology application. In the study, participants did not presuppose risk concerns a lot on nanotechnology products when risk aspects were not discussed in the survey. People can be induced to perceive more on benefit when they are only exposed to benefit communication. It actually implies that consumers are not nanotechnology application resistant, otherwise they would not have relatively neutral risk perception in the study and easily induced to perceive benefits of the applications.

Published researches figured that end-consumers are on a vulnerable position to perceive benefit of novel technology compared with experts, as a result they overestimate the risk of novel application (Bruhn, 2007). Most researchers worked on risk perception as the "situation and problem statement" chapter of this paper showed. However, this study focus more on benefit perception and personal benefit perception is proved to make biggest differences on willingness to pay comparing with the other three types of perception by data. It indicated the perceived benefit for consumers themselves is the most important stimulation of buying a novel technology application. In other words, stakeholders can argue about high societal benefit, low personal and societal risk concern for nanotechnology application, but it would not loom direct effect on consumers' buying decision, and high personal benefit perception is the only exception. Perception of risk and benefit are demonstrated to be inversely related (Alhakami & Slovic,1994). In this sense, increasing benefit perception will reduce risk perception. Consumers will have low risk perception towards a technology when they perceive high personal benefit. To conduct further research about personal benefit perception can be interesting.

The relationship between goal and attitude received less interest than each construct individually (Ferguson & Porter, 2009). This paper attempted to study this relationship by match condition between goal and application. However, the results of data figured that match cannot stimulate consumer to perceive higher benefit or lower risk in attitude formation process. In a word, personal benefit perception plays a salient role in consumers' willing to pay (acceptance), but does not matter with match condition. This conclusion seems to against people's common sense. It may be deserved to be tested again by other method and sample if other researchers have interest. On the other hand, the research about reasons behind the result might also be interesting.

Four types of perception are all demonstrated to be interconnect, except for personal benefit perception and societal risk perception. Consumers are unable to perceive perceptions separately. It is in line with other researches. Nevertheless, participants imply their perception on personal benefit and societal risk are not related while their perception on personal risk and societal benefit is related. The reasons behind have not been studied by this paper. This result can be paid attention for future research.

Reference

Alhakami, A. S., & Slovic, P. (1994). A psychological study of the inverse relationship between perceived risk and perceived benefit. Risk analysis,14(6), 1085-1096.

Bargh, J. A., & Huang, J. Y. (2009). The selfish goal. The psychology of goals, 127-150.
Batson, C. D. (2014). The altruism question: Toward a social-psychological answer. Psychology Press.

Bearth, A., & Siegrist, M. (2016). Are risk or benefit perceptions more important for public acceptance of innovative food technologies: A meta-analysis. Trends in Food Science & Technology, 49, 14-23.

Bruhn, C. M. (2007). Enhancing consumer acceptance of new processing technologies. Innovative Food Science & Emerging Technologies, 8(4), 555-558.

Buzby, J. C. (2010). Nanotechnology for food applications: More questions than answers. Journal of Consumer Affairs, 44(3), 528-545.

Custers, R. (2009). How does our unconscious know what we want? The role of affect in goal representations. na.

Deci, E. L., & Ryan, R. M. (2000). The" what" and" why" of goal pursuits: Human needs and the self-determination of behavior. Psychological inquiry, 11(4), 227-268.

Dik, G., & Aarts, H. (2007). Behavioral cues to others' motivation and goal pursuits: The perception of effort facilitates goal inference and contagion. Journal of Experimental Societal Psychology, 43(5), 727-737.

Fast food menu. (2016) Dairy Queen Prcies, Retrived from http://www.fastfoodmenuprices.com/dairy-queen-prices/

Ferguson, M. J., & Porter, S. C. (2009). Goals and (implicit) attitudes. The psychology of goals, 454-460.

Fischer, A. R., van Dijk, H., de Jonge, J., Rowe, G., & Frewer, L. J. (2013). Attitudes and attitudinal ambivalence change towards nanotechnology applied to food production. Public Understanding of Science, 22(7), 817-831.

Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S., & Combs, B. (1978). How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. Policy sciences, 9(2), 127-152.

Frewer, L. J., Fischer, A. R. H., Brennan, M., Bánáti, D., Lion, R., Meertens, R. M., ... & Vereijken, C. M. J. L. (2014). Risk/benefit communication about food–a systematic review of the literature. Critical reviews in food science and nutrition, (just-accepted), 00-00.

Frewer, L. J., Fischer, A. R., & van Trijp, J. H. C. (2011). Communication of Risks and Benefits of Nanotechnology: the Issue of Societal Acceptance of Emerging Technologies. Nanotechnology in the Agri-Food Sector, 244, 49.

Frewer, L. J., Gupta, N., George, S., Fischer, A. R. H., Giles, E. L., & Coles, D. (2014). Consumer attitudes towards nanotechnologies applied to food production. Trends in Food Science & Technology, 40(2), 211-225.

Frewer, L. J., Howard, C., & Shepherd, R. (1998). Understanding public attitudes to technology. Journal of Risk Research, 1(3), 221-235.

Giesen, R. I., Fischer, A. R., Dijk, H., & Trijp, H. (2015). Tracing Attitude Expressions: An Eye-Tracking Study. Journal of Behavioral Decision Making.

Grant, H., & Gelety, L. (2009). Goal content theories: Why differences in" what" we are striving for matter. na.

Haringk, F., Van Dijk, E., Van Beest, I., & Mersmann, P. (2007). When gains loom larger than losses reversed loss aversion for small amounts of money.Psychological science, 18(12), 1099-1105.

Higgins, E. T. (2009). Regulatory fit in the goal-pursuit process (p. 505). na.

Juma, C. (2016). Innovation and Its Enemies: Why People Resist New Technologies. Oxford University Press.

Kang, X., Guo, X., & You, H. (2015). The Economic and Societal Benefits of Off-Gas Utilization in China. Energy Sources, Part B: Economics, Planning, and Policy, 10(2), 148-154.

Long, H., & Ma-Wyatt, A. (2014). The distribution of spatial attention changes with task demands during goal-directed reaching. Experimental brain research, 232(6), 1883-1893.

Lutz, S., & Huitt, W. (2003). Information processing and memory: Theory and applications. Educational Psychology Interactive. Valdosta, GA: Valdosta State University.

McLeod, S. A. (2008). Information Processing. Retrieved from www.simplypsychology.org/information-processing.html

Melenhorst, A. S., & Bouwhuis, D. G. (2004). When do older adults consider the internet? An exploratory study of benefit perception. Gerontechnology,3(2), 89-101.

Miles, S., & Frewer, L. J. (2001). Investigating specific concerns about different food hazards. Food quality and preference, 12(1), 47-61.

Moskowitz, G. B., & Grant, H. (Eds.). (2009). The psychology of goals. Guilford Press.
Nanotechnology. (2016). In Encyclopædia Britannica. Retrieved from http://academic.eb.com/levels/collegiate/article/384821

Nunes, C. A., Pinheiro, A. C. M., & Bastos, S. C. (2011). EVALUATING CONSUMER ACCEPTANCE TESTS BY THREE- WAY INTERNAL PREFERENCE MAPPING OBTAINED BY PARALLEL FACTOR ANALYSIS (PARAFAC). Journal of Sensory Studies, 26(2), 167-174.

Pitblado, R., Bardy, M., Nalpanis, P., Crossthwaite, P., Molazemi, K., Bekaert, M., & Raghunathan, V. (2012). International comparison on the application of societal risk criteria. Process Safety Progress, 31(4), 363-368.

Rahimpour, M., Rahimpour, M., Gomari, H., Shirvani, E., Niroumanesh, A., Saremi, K., & Sardari, S. (2012). Public perceptions of nanotechnology: A survey in the mega cities of Iran. NanoEthics, 6(2), 119-126.

Roco MC, Mirkin CA, Hesam MC (2010) Nanotechnology research directions for societal needs in 2020: retrospective and outlook. WTEC Study on Nanotechnology Research Directions, World Technology Evaluation Center, Arlington

Schenk, M. F., Fischer, A. R. H., Frewer, L. J., Gilissen, L. J. W. J., Jacobsen, E., & Smulders, M. J. M. (2008). The influence of perceived benefits on acceptance of GM applications for allergy prevention. Health, Risk and Society, 10(3), 263-282.

Schenk, M. F., van der Maas, M. P., Smulders, M. J., Gilissen, L. J., Fischer, A. R., van der Lans, I. A., ... & Frewer, L. J. (2011). Consumer attitudes towards hypoallergenic apples that alleviate mild apple allergy. Food quality and preference, 22(1), 83-91.

Sheth, J. N., & Stellner, W. H. (1979). Psychology of innovation resistance: The less developed concept (LDC) in diffusion research. Urbana-Champaign, IL: College of Commerce and Business Administration, University of Illinois at Urbana-Champaign.

Siegrist, M., & Cvetkovich, G. (2000). Perception of hazards: The role of societal trust and knowledge. Risk analysis, 20(5), 713-720.

Siegrist, M., Cousin, M. E., Kastenholz, H., & Wiek, A. (2007). Public acceptance of nanotechnology foods and food packaging: The influence of affect and trust. Appetite, 49(2), 459-466.

Simon, H. A. (1972). Theories of bounded rationality. Decision and organization, 1(1), 161-176.

Singh-Ackbarali, D., & Maharaj, R. (2014). Sensory evaluation as a tool in determining acceptability of innovative products developed by undergraduate students in food science and technology at the university of Trinidad and Tobago. Journal of Curriculum and Teaching, 3(1), 10.

Slovic, Paul Ed. The perception of risk. Earthscan publications, 2000.

Steenis, N. D., & Fischer, A. R. (2016). Consumer attitudes towards nanotechnology in food products: an attribute-based analysis. British Food Journal, 118(5), 1254-1267.

van Dam, Y. K., & Fischer, A. R. (2015). Buying green without being seen. Environment and Behavior, 47(3), 328-356.

van Dijk, H., Fischer, A. R., & Frewer, L. J. (2011). Consumer Responses to Integrated Risk-Benefit Information Associated with the Consumption of Food. Risk Analysis, 31(3), 429-439.

van Dijk, H., Fischer, A. R., Marvin, H. J., & van Trijp, H. C. (2015). Determinants of stakeholders' attitudes towards a new technology: nanotechnology applications for food, water, energy and medicine. Journal of Risk Research, 1-22.

van Giesen, R. I., Fischer, A. R., & van Trijp, H. C. (2016). Changes in the influence of affect and cognition over time on consumer attitude formation toward nanotechnology: A longitudinal survey study. Public Understanding of Science, 0963662516661292.

van Giesen, R. I., Fischer, A. R., van Dijk, H., & van Trijp, H. C. (2015). Affect and cognition in attitude formation toward familiar and unfamiliar attitude objects. PloS one, 10(10), e0141790.
Yue, C., Zhao, S., Cummings, C., & Kuzma, J. (2015). Investigating factors influencing consumer willingness to buy GM food and nano-food. Journal of Nanoparticle Research, 17(7), 1-19.

APPENDIX A Questionnaire

Nanotechnology Application: The Role of Goal – Product Match

Introduction "For quality of life." is the motto and pursuit of Wageningen University and Research Centre. Wageningeners always try to explore potential of nature and to improve the quality of life. This is a study for the research about consumer response towards nanotechnology applications. We are very grateful to your participation.

Q1_Goal Please select the single product you would like to try most.

- ❍ Cookie with nice flavor, ranked as the best taste in a Dutch market survey (1)
- ❍ Cookie with more nutrient elements, as proven by a scientific association (2)
- ❍ Cookie produced by an energy-saving production system, which is more environmental friendly (3)
- ❍ Cookie produced through fair trade, which brings more benefits for workers in developing countries (4)

Q2 Here is a chocolate drink with premium good flavor but without extra sugar. The chocolate milkshake has enhanced taste using an advanced form of cocoa, which benefits from nanotechnology. It would be the favourite of taste fans.

WTP_FLAV The average price of a regular chocolate milkshake drink in market is 2.8 euro. How much you are willing to pay for this product?
_____ Price (1)

Info Please indicate how much you agree with the statements.

BeneME 1_FLAV The product is good for me.
_____ Your Opinion (1)

BeneME2_FLAV The product adds more benefits than regular ones for me.
_____ Your Opinion (1)

BeneME3_FLAV The product brings additional benefits to me.
_____ Your Opinion (1)

BeneSO1_FLAV The product is good for society.
_____ Your Opinion (1)

BeneSO2_FLAV The product adds more benefits than regular ones for society.
_____ Your Opinion (1)

BeneSO3_FLAV The product brings additional benefits to the society.
_____ Your Opinion (1)

RisME1_FLAV The product is risky for me.
_____ Your Opinion (1)

RisME2_FLAV The product is riskier than regular ones for me.
_____ Your Opinion (1)

RisME3_FLAV The product brings additional risks to me.
_____ Your Opinion (1)

RisSO1_FLAV The product is risky for society.
_____ Your Opinion (1)

RisSO2_FLAV The product is riskier than regular ones for society.
_____ Your Opinion (1)

RisSO3_FLAV The product brings additional risks to society.
_____ Your Opinion (1)

Q3 Here is a chocolate milkshake drink added with flexible, color-changing nano-based ingredients, bad bacteria could be detected from milk carton. You can indicate whether the milk is safe to have or not from its package. Sometimes product is still safe to have after expiry date. Hence, to detect the exact date of product can longer the use of product and decrease food waste at the end, which relief environment pressure on our earth.

WTP_SAFE The average price of regular chocolate milkshake drink in market is 2.8 euro. How much you are willing to pay for this product?
_____ Price (1)

Info Please indicate how much you agree with the statements.

BeneME 1_SAFE The product is good for me.
_____ Your Opinion (1)

BeneME 2_SAFE The product adds more benefits than regular ones for me.
_____ Your Opinion (1)

BeneME 3_SAFE The product brings additional benefits to me.
_____ Your Opinion (1)

BeneSO 1_SAFE The product is good for society.
_____ Your Opinion (1)

BeneSO 2_SAFE The product adds more benefits than regular ones for society.
_____ Your Opinion (1)

BeneSO 3_SAFE The product brings additional benefits to the society.
_____ Your Opinion (1)

RiskME 1_SAFE The product is risky for me.
_____ Your Opinion (1)

RiskME 2_SAFE The product is riskier than regular ones for me.
_____ Your Opinion (1)

RiskME 3_SAFE The product brings additional risks to me.
_____ Your Opinion (1)

RiskSO 1_SAFE The product is risky for society.
_____ Your Opinion (1)

RiskSO 2_SAFE The product is riskier than regular ones for society.
_____ Your Opinion (1)

RiskSO 3_SAFE The product brings additional risks to society.
_____ Your Opinion (1)

Q4 Zinc is an essential mineral for humans. Here is a chocolate milkshake drink with colloids of zinc nanoparticles which enhances uptake and/or target delivery of zinc. Milk is supposed to perform poorly on zinc uptake and distribution. But for this product, your intake of zinc benefits from nanotechnology development.

WTP_NUTR The average price of regular chocolate milkshake drink in market is 2.8 euro. How much you are willing to pay for this product?
_____ Price (1)

Info Please indicate how much you agree with the statements.

BeneME1_NUTR The product is good for me.
_____ Your Opinion (1)

BeneME2_NUTR The product adds more benefits than regular ones for me.
_____ Your Opinion (1)

BeneME3_NUTR The product brings additional benefits to me.
_____ Your Opinion (1)

BeneSO1_NUTR The product is good for society.
_____ Your Opinion (1)

BeneSO2_NUTR The product adds more benefits than regular ones for society.
_____ Your Opinion (1)

BeneSO3_NUTR The product brings additional benefits to the society.
_____ Your Opinion (1)

RisME1_NUTR The product is risky for me.
_____ Your Opinion (1)

RisME2_NUTR The product is riskier than regular ones for me.
_____ Your Opinion (1)

RisME3_NUTR The product brings additional risks to me.
_____ Your Opinion (1)

RisSO1_NUTR The product is risky for society.
_____ Your Opinion (1)

RisSO2_NUTR The product is riskier than regular ones for society.
_____ Your Opinion (1)

RisSO3_NUTR The product brings additional risks to society.
_____ Your Opinion (1)

Q5 A Dutch company invests in cacao bean farms in Congo (Africa), with technology support from Netherland, such as nano pesticides for plant protection and production. It provides over 100 more employments for local farmers. The cacao from this company is used to produce chocolate milkshake drinks target in Dutch market.

WTP_FAIRTR The average price of regular chocolate milkshake drink in market is 2.8 euro. How much you are willing to pay for this product?
_____ Price (1)

Info Please indicate how much you agree with the statements.

BeneME1_FAIRTR The product is good for me.
_____ Your Opinion (1)

BeneME2_FAIRTR The product adds more benefits than regular ones for me.
_____ Your Opinion (1)

BeneME3_FAIRTR The product brings additional benefits to me.
_____ Your Opinion (1)

BeneSO1_FAIRTR The product is good for society.
_____ Your Opinion (1)

BeneSO2_FAIRTR The product adds more benefits than regular ones for society.
_____ Your Opinion (1)

BeneSO3_FAIRTR The product brings additional benefits to the society.
_____ Your Opinion (1)

RisME1_FAIRTR The product is risky for me.
_____ Your Opinion (1)

RisME2_FAIRTR The product is riskier than regular ones for me.
_____ Your Opinion (1)

RisME3_FAIRTR The product brings additional risks to me.
_____ Your Opinion (1)

RisSO1_FAIRTR The product is risky for society.
_____ Your Opinion (1)

RisSO2_FAIRTR The product is riskier than regular ones for society.
_____ Your Opinion (1)

RisSO3_FAIRTR The product brings additional risks to society.
_____ Your Opinion (1)

Gender What is your gender?
- ❍ Male (1)
- ❍ Female (2)
- ❍ Other (3)

Age What is your age?
- ❍ 18~25 (1)
- ❍ 26~30 (2)
- ❍ 31~40 (3)
- ❍ 41~65 (4)
- ❍ Above 65 (5)

Education What is your education background?
- ❍ None or primary education (1)
- ❍ Secondary education (high school) (2)
- ❍ Post-secondary (vocational school) (3)
- ❍ Bachelor or equivalent (4)
- ❍ Master or equivalents and above (5)

Nationality What is your nationality?

Q85 Thank you for your time! All the information you offer is confidential and it will be only used for research. In these recent 10 years, nanotechnology is one of the most important new technologies. It is expected to have at least $1 trillion impact globally by 2020. Many social scientists and students like me are working for this inspiring field. Your kindness as a participant will contribute your own part to social science research.