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Master Thesis

Decision Process of Technology Early Adopters, Impact of Utility Function and Opportunity Cost

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Abstract

With the increase in technology offering as services or technological devices, consumers respond to new products at various waves in the product life cycle. The key interest in such a new product is meeting a specific acceptance by the early adopters allowing it to become viable in the early stages of the product life cycle. As the acceptance by the early adopters' segment of the market is related in achieving the products launch allowing it to secure the initial market penetration viability threshold, identifying decision making patterns and rationales in early adopters will provide information that can be utilized to meet consumer expectation in future technology products. The suggested methodology to tackle the above is using a structured questioner that aims to (a) identify someone as an early adopter, (b) to also rank the subjective utility function of the consumer on each product, (c) to also rank the subjective opportunity cost against similar products. Following the above rationale, a consumer successfully identified as early adopter will potentially denote one of the following (i) utility function and opportunity cost are aligned thus the decision-making criteria was correct, (ii) utility function and opportunity cost are not aligned thus the decision-making criteria was false. The above methodology aims to only demonstrate by cross examining utility-function and opportunity cost the decision-making process of early adapters and provide optimization insights on rational choice theory for the specific target group.

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Chapter 1. Introduction

Technological innovations over the last decade have shaped a dynamic and fast changing environment fundamentally changing aspects of consumer life. The immersion of new technologies and applications such as artificial intelligence (AI), machine learning (ML) and the broad application of Internet of Things (IoT) have spiraled a new wave of both product and services.

The evolution of such products and services and their launch to the market often creates asymmetries in the level of familiarization with the consumer base. Those asymmetries can be seen in terms of concerns around ethics in the use of AI, cybersecurity and data privacy exposure for consumers due to improper use or ignorance in potential exposure.

Adaptation of technology is happening in way faster paces than the past and studies are linking this to an extend because of COVID-19 where the consumer behavior was impacted drastically by limitations on mobility as well as from the remote work environment that saw an extreme increase.

Large amounts of consumers, either in their individual capacity or as part of the workforce, were forced to change their habits and employe new tools, products and services to keep up with their daily life. The fact is that boosted the consumption of technology consumer goods, content streaming services, use of home automations etc.

In this dynamically changing environment, the understanding of consumer behavior and the ability to identify Early Adopters within the mass is of significance. Being able to effectively identify Early Adopters would allow a better understanding of the way they perceive technology, accumulate information as well as their interaction with the rest of society.

Such an opportunity to identify Early Adopters in real time at the time of entry to a technology, would also allow a streamlined application of the output to multiple disciplines such as marketing, decision analysis, economics, consumer behavior as well as to offer a verification opportunity to all the crucial decisions made during a product design stage.

Chapter 2. Theoretical Background

This chapter is dedicated to exploring the theoretical background of the field of study by reviewing the available literature and predominant theories.

This literature review aims to highlight theoretical elements and theoretical methods that can be adopted in the later stages of the methodological development related to the creation of a structured questionnaire. The structured questionnaire will be able to identify traits commonly associated with Early Adopters aiming to allow their characterization as such.

Literature review in Consumer Behavior is challenging due to the constantly evolving nature of the domain where new knowledge is constantly generated. Though in this attempt to define the areas of interest, general traits of the Early Adopters and their decision-making mechanisms, we will resort to the theoretical foundations of Diffusion of Innovation Theory and Technology Acceptance Model.

Within the scope of this master's thesis is to also explore fundamental economic concepts such as Utility Theory in terms or Utility Value and Preference. The above extends to also explore the concept of assessing viable alternatives and in that sense fundamental economic concepts such as opportunity cost will be explored.

As the domain of Decision Theory and Consumer Behavior spans beyond the above-mentioned disciplines, this master's thesis also explores the concepts from different disciplines such as psychology, sociology and behavioral economics.

Those theoretical frameworks will be clearly described in the subsequent parts of the chapter. Their potential use and specific interest will be described as well as the scope of utilizing the specific frameworks.

The elements and expected validation of the theoretical frameworks will be described in chapter 3 where the methodology is formulated.

2.1 Diffusion of Innovation Theory

Everett M. Rogers in 1962 set the ground for Diffusion of Innovation Theory [1] as a framework to explore and explain how, why and the rate new ideas, innovations and new technologies spread and gain traction in a society. Rogers in his work describes the social processes and mechanisms that facilitate the adoption of new ideas and innovations mapping the diffusion process.

The Diffusion of Innovation Theory defines an innovation as any idea, process or object perceived as new by an individual. The rate of adaptation of those innovations varies. This variation is based on factors such as compatibility, advancement and complexity. These factors define the speed and width of acceptance in society.

The primary focus of the theory is communication channels in the diffusion process. These channels are the means that facilitate diffusion, and innovations are communicated across the societal structure. Communication channels in terms of diffusion can span from mass media to interpersonal networks and are the fundamental cell of spreading knowledge about innovations influencing individuals to potentially adopt them.

Rogers describes a five-stage innovation-decision where time and sequence of events formulate a process that all individuals go through when exposed to the potential of adopting an innovation. **Knowledge**, **persuasion**, **decision**, **implementation** and **confirmation**.

At the knowledge stage, individuals are exposed to the innovation and gain basic understanding of the functions of such innovation. The persuasion stage is where they form either a favorable or unfavorable attitude towards the innovation. At the decision stage, they decide to either adopt or reject the innovation. Implementation follows as the innovation is put into use and finally, confirmation stage comes when the individual has decided seeking positive of negative affirmation on their decision. At this stage a decision may be altered in the event of conflicting information.

As for the rate of adaptation, Diffusion of Innovation Theory classifies adopters into five categories. Innovators, Early Adopters, Early Majority, Late Majority and Laggards.

Innovators are venturesome and willing to take risks. Often being the first to try new ideas. **Early Adopters** are respected opinion leaders that adopt new ideas early but with caution. The **Early Majority** is more cautious and adopts innovations right before the average member of society. **Late Majority** is mostly skeptical and adopts innovations after the majority of society and finally **Laggards** who are traditional and resistant to change as well as being the last to adopt innovation.

Factors that impact the adaptation of innovation cycle are: **Relative Advantage** describing what constitutes the innovation better than the one before, **Compatibility** referring to the alignment to values, needs and experiences of the adopters, **Complexity** focusing on the difficulty of understanding or use the innovation by adopters, **Trialability** describing the extent on which the innovation can be applied to and **Observability** measuring the visible results of an innovation to others.

The theory's core revolves around concepts such as communication channels, time, social systems and adoption are universally applicable to this day. They constitute milestones and a foundation in the understanding of consumer behavior and technology adoption.

Although at the time of suggesting the theory technological advancements were not as rapid as they are in modern society, the framework concept of the theory applies to all modern technologies such as social media, electric vehicles, renewable energy etc. Application of the theory still assists in successful predictions and the classification of adopters.

Besides the adaptation of technology, the theory has also been utilized in large societal reforms and restructures where the acceptance of a change in the "status quo" needs to be theorized and societal impact in terms of adaptation needs to be explored. In this regard, it has been utilized in strategic planning on all scales. The above is possible due to the fact that besides the individual is the primary focus of the theory, social interaction is the catalyst.

The exploration of social interaction and the level of influence among social circles is what allows the theory to expand and remain relevant.

For the scope of this master's thesis, we will further explore the characteristics and traits of Early Adopters by trying to formulate a methodology of identifying them.

2.2 Early Adopters

Following the Diffusion of Innovation Theory, a description of Early Adopters and their importance in the diffusion of new technologies needs to be developed to allow a better understanding of their selection as the target group of this study.

Early Adopters are the crucial segment of consumers that are directly linked to the success of failure of a new technology in the market. They are the critical mass that allows traction in a new technology hinting towards market viability. This crucial role in a product lifecycle bridges the gap between Innovators and the mass market and impacts the general acceptance of the innovation.

The description of Early Adopters heavily relies on their position within their social system. They are integrated within their social circles and are often respected by their peers with a highly likelihood of influencing opinions. Early Adopters are not as risk avert as Innovators and their decisions are thought to be well calculated based on review of the innovation in terms of practical applications and general potential for mass adaptation. Early adopters tend to not take risks on an innovation purely based on the fact of novelty and this is a key factor that sets them apart from Innovators.

The demographic characteristics of the Early Adopters are generally younger, more educated with a better financial capacity and of higher social status than Late Adopters. A consensus on the demographic characteristics is that the combination of those allows them to recover from any potential financial or social risks of adaptation.

The specific group tends to invest more time in researching primary sources of information related to any future technology adaptations by their end and at the same time capitalize on information related to trends in technology advancements. That fact allows for a deeper understanding of each technology, its application and the ability to further diffuse the benefits or value proposition to the rest of society.

A cited description from Rogers theory related to the group describes them as:

An integrated part of the social system compared to the innovators. Compared to the cosmopolites Innovators, Early Adopters are localites with a great degree of opinion leadership in most social systems. They are the cluster that potential adopters seek advice and information from. Early adopters are considered a catalyst on the adaptation process of a new idea or innovation as they can accelerate the diffusion process. Early adopters are the link between innovators and the rest of the adopters as their characteristics are not far from the rest of the adaptation clusters. They can be looked at as role models and they are esteemed by their peers. They know that to retain this position they must make judicious innovation decisions. In that sense the role of an early adopter is to decrease uncertainty and convey subjective evaluation of the idea or the innovation to near-peers by means of interpersonal networks.

The fact that Early Adopters can be seen as catalysts and role models to the other groups sets the interest of further exploration and identification of Early Adopters within society for this thesis.

While in Marketing Early Adopters are primarily targeted to ensure an innovations diffusion across the Market, from a decision-making perspective, further understanding of Early Adopters background and what shapes them will potentially unlock a better understanding of their decision-making process.

It would have been simplistic to state that only the fact of age, education and financial resources is what drives this specific group to have a specific stance towards risk, a tendency for deep understanding of the innovation and their societal role. Again, in the Diffusion of Innovation theory there is a mention to Early Adopters based on some socioeconomic characteristics that have been observed but literature review was not able to provide an updated view on those characteristics.

1. *Earlier adopter are not different from later adopters in age.*
2. *Earlier adopters have more years of education that later adopters have.*
3. *Earlier adopters are more likely to be literate than are later adopters*
4. *Earlier adopters have higher social status than later adopters*
5. *Earlier adopters have a greater degree of upward social mobility than later adopters*
6. *Earlier adopters have larger-sized units (companies etc) than later adopters*
7. *Earlier adopters are more likely to have a commercial economic orientation than are later adopters.*
8. *Earlier adopters have a more favorable attitude towards credit (borrowing money) than later adopters*
9. *Earlier adopters have a more specialized operations than later adopters*

Of course, data from 1962 are unsafe to be taken into consideration at this point in time and are only taken into consideration as mild indicators that potentially still differentiate Early Adopters from Later Adopters.

A last factor to be taken into consideration with the specific group is the decision-making process that is described in theory as well calculated taking into account all the parameters of viability and value proposition. This statement denotes that outside all other groups, individuals within the Early Adopters segment demonstrate a rational decision-making pattern within parameters of decision-making within Certainty. The term and level of certainty will be explored further in the literature review.

2.3 Technology Acceptance Model (TAM)

Fred Davis in 1986 suggested a framework of technology adaptation in information systems called Technology Acceptance Model [2] abbreviated TAM.

TAM aims to enlighten and predict the acceptance and use of technology by users by acknowledging two main pillars. Perceived Usefulness (PU) and Perceived Ease of Use (PEOU).

Perceived Usefulness (PU) represents the belief of an individual in the enhancement a technology provides in completing a task or assisting in the execution of a job. PU impacts the individual in the intention to use a new technology. If an individual sees a new technology as beneficial compared to the current state, the more likely to adopt the new technology

Perceived Ease of Use (PEOU) represents the degree an individual believes that the use of a specific technology or technological product would be trouble-free in its use or free from the effort to learn the new technology's operation. PEOU impacts the willingness and intention of an individual to onboard this new technology or product. The easiest a product is perceived in terms of use, the more likely it is to be assessed as useful and be adopted by consumers.

TAM model can be broken down into four simple criteria that structure the model.

1. **External Variables** that influence PU and PEOU.

   As external variables we describe the indirect variables that can affect both PU and PEOU. External variables according to the model are:

   I. System Characteristics:

   a. **Design features:** such as user experience, user interface, ease of use and functionality.
   b. **The Quality:** of the output of a system. Is it accurate? Is it performed within a timely manner? Are the outputs an enhancement to the prior state?

   II. User Characteristics

   a. **Demographics**: Gender, age, education, technology awareness level and familiarization / prior experience with similar technologies.
   b. **Confidence:** as a level of the individual's belief in their ability to operate a technology product.

III. Social Influence

a. **Subjective Norms:** Those norms try to measure the influence or pressure from social circles such as co-workers, peers, superiors in the use of technology.
b. **Social Norms:** Those norms try to measure cultural and societal norms that can effect the decision or general attitude towards a technology.

IV. Organization Context

a. **Support and Training:** potential support or training in a specific technology or product can affect PEOU of an individual favoring the technology as to making it easier to use.
b. **Management** Support: Managerial Support towards a system or technology can influence PU at an organization level indirectly influencing the individual.

V. Technology Context

a. **Compatibility:** measuring the ability of a technology to integrate with existing systems and solutions can impact both PU and PEOU
b. **Reliability**: Performance and reliability of the technology can impact the individual's perception of usefulness.

VI. Experience with Previous Technologies

a. **Past Usage:** experiences from past use of similar technologies or technologies in general can impact both in a good or a bad way impacting the individual's perception of the technology in question.

VII. Task Characteristics:

a. **Relevance:** measures the ability and degree to which the technology supports the task at hand.
b. **Complexity:** The degree of complexity the technology simplifies the more chances for an individual to favor this technology.

The above elements tend to shape a consumer's impression and experience about a technology and a technology product.

As an example to model and to utilize the above variables, in the early days of computer systems it was typical for organizations to support the implementation of computer terminals operating in a specific operating system. Tasks were executed faster, no prior technology experience existed, management was strongly backing the implementation of the terminals and training opportunities for familiarization existed within the organizations. Peers would discuss the usefulness of a said operating system and the chances for an individual to select the same operating system for home use was significant as both PU and PEOU were relatively high on the said operating system.

2. Perceived Ease of Use affects Perceived Usefulness.

PEOU and PU are interlinked to the degree PEOU affects PU in the following ways:

I. Reduction of Effort:

a. **Simplified Tasks:** easy to use technologies reduce effort both physical and cognitive in the execution of tasks.
b. **Efficiency:** completion rate of tasks, reduction of effort and time and the ability to do more in the same time frame provides the individual with a hassle-free experience.

II. Learning and Adoption:

a. **Confidence:** a technology that is easy to use allows the individual to perform more tasks as the level of confidence in use and results is higher.
b. **Learning Curve:** the higher the level of operating a technology by a user the quicker it gets to produce results and the quicker the adaptation of the technology happens.

III. Performance:

a. **Performance:** easy-to-use technology is more likely to be used in a correct way. Propper use of the technology strengthens the usefulness of the technology to the user's perception.
b. **Less Errors:** easy-to-use technology minimizes the risk of errors. Less errors builds confidence and reliability in the user.

IV. Positive User Experience:

a. **Satisfaction:** the degree of satisfaction in the use of a technology related to positive experience in the use of it is directly linked with the usefulness of a technology by the user.
b. **Engagement:** An easy-to-use technology allows extensive use. The more a technology is used by the end user, the more they appreciate the existence of it.

V. Perceived Control:

a. **Control and Autonomy:** easy to use technologies provide a level of control in the outputs by the user. The more they present the level of control and autonomy the more use they are likely to enjoy by the user in multiple scenarios.
b. **Adaptability**: easy to use technologies in addition to the above are more likely to be used in different scenarios by the user to respond to needs that might have not been initially planned.

The result of the above is that PEOU impacts PU in the sense of easy-to-use technologies that with a reduced effort can achieve more for the user. The factor of ease of use is the key element in design and catalyst for the successful longevity of technology. By also allowing a sense of control and autonomy, the user explores different areas of application and builds confidence by repeated use. All the above result in a higher usefulness perceived by the user.

3. **Perceived Usefulness** and **Perceived Ease of Use** influence **Behavioral Intention to Use**.

PU influence behavioral intention in the sense of pointing out the direct advantages of the technology to the user driving the user to deeply engage in the specific technology. PEOU on the other hand, influences behavioral intention in the sense of reducing complexity and decrease in effort in task execution.

The above statement can be examined as follows:

PU directly influences the user in outcome expectation building the belief that a technology can enhance effectiveness and productivity and building a high perceived value proposition in the sense of adding significant value in the output of a task based on the use of the said technology. This explores the perceived added value of the technology to the user, based only in the fact that the technology was utilized in the completion of a task. Building on the above perceived added value, motivation to use the technology by the user in a scenario where the user believes that the technology can achieve a set output with a desired set of standards increases the intention to use the technology. This loop combined with past positive experiences of the technology, may increase the intention of the user in continued use of the technology.

PEOU and behavioral intention to use is directly related to the expectation of reduced effort. Easy to use technologies, lower the expected effort and increase interest in utilizing such technologies to achieve set goals. Moreover, the usability factor might also increase the attractiveness of a technology constituting the technology more likely to be used in a scenario. Usefulness is also factored in, that ease of use breaks the barrier to employ such a technology from the user and can lead to a faster adaptation process. Lastly, easy to use technology increases the confidence of users making it more likely to use the technology.

PU and PEOU are interlined in this manner allowing a user to perceive technology as an easy-to-use solution with high level of versatility to address multiple use scenarios and receive a quality output saving time and effort. They result in a generally accepted positive attitude by the user leading to high levels of usability.

4. **Behavioral Intention to Use** leads to **Actual Use**.

The key point in this waterfall model is the transition from Behavioral Intention to Use to Actual Use.

The model defines two possible pathways in transitioning from Behavioral Intention to Use (BIU) to Actual Use. The first so called Direct Pathway and the second one being Indirect Pathway. In both approaches BIU has a critical role as a predictor of Actual Use with a higher BIU resulting in higher chance of Actual Use.

The Direct Pathway explores motivational forces where strong intention to use a technology act as a motivation force driving the user to engage with the technology and act. A strong BIU indicator denotes a level of commitment by the user to employe the technology in daily life or regular activities. The intention to use indicates a level of mental commitment where the user is planning actions resulting in Actual Use. In addition to the mental commitment, behavioral planning traits such as preparation on how to use such technology by the user and exploring different application scenarios are taking place. Those preparations can constitute training in the use of the technology, development of necessary infrastructure to facilitate the technology, amending daily routines to foster the use of the technology etc. As a last step the overcoming of barriers to finally employe the technology includes the prediction and possible solution to any potential barrier such as technical difficulties, time constraints etc.

The Indirect Pathway on the other hand builds on the premises of high BIU that then translates to a positive attitude towards the technology. PU and PEOU are influencing this positive attitude stimulating expectations from the use of technology. When the expectation is high in terms of benefit and ease of use, users have a natural tendency to put the effort in transitioning to the technology jumping from intention to action. This expectation is strengthened from any initial use of the technology as positive experiences with early exposure and use can transmute into building a habit of use. In addition, any initial use of the technology can strengthen or adjust the opinion and perceived benefits of the technology for the user influencing their intention to actual use.

No matter the pathway, there are some crucial factors that influence the transition to Actual Use. These factors are related to the facilitation of the transition, influence on the transition and the formation of habits.

I. Facilitation:

The smoothness of transition in the sense of support to the user is crucial. A user with access to technical support or assistance in use of technology is easier to make the transition as the level of confidence in solving any potential onboard issues is “guaranteed” to find solution. In addition, any resources available to educate the user in terms of operation, support, troubleshooting further enhance the transition.

II. Influence:

Peer encouragement and individuals that have a high level of influence to the user can expedite or act as catalysts to the onboard process resulting in Actual Use. Social reinforcement in the sense of demonstrating acceptance to the technology by an immediate social circle can stimulate peer pressure or motivation.

Depending on the scenario, in example technology heavy environments, a user might feel pressure or obligation to employe new technologies facilitating the transition from intention to actual use. Although this "social obligation" may be a sub-optimal motivation factor, social norms may often be the center of technology's Actual Use.

III. Habit:

Last but not least, the factor of building habits plays a key role in the transition to Actual Use. By exposing in new technologies and extensive use of such technologies a habit is built. This habit-forming process creates less obstacles and skews the conscious use to a more automatic nonconscious approach where the user resorts to Actual Use by matter of constant exposure. Although the process is nonconscious, the level of utilization is high due to the fact that the Actual Use process came naturally from building a habit thus being a more consistent use case scenario.

Although the TAM model is simplistic in nature it demonstrates some key elements in the compliment in terms of this master's Thesis the Diffusion of Innovation theory providing insights into Perceived Usefulness, Perceived Ease of Use and User Acceptance of a technology. Those factors can be further incorporated into the methodology of the questionnaire and assist to identify the reasons for entry to the new technology by a user.

Moreover, although the TAM model has been developed to demonstrate the adaptation of systems, only minor changes have been made in the model review in this chapter, primarily to align terms with the scope of this Thesis.

As the TAM model goes through the process of an individual to shape an opinion on a technological product, it is rational to assume that an Early Adopter goes through the specific process prior solidifying their will to proceed with a purchase of a product or service. TAM has universal application, and the premise is that every rational consumer / individual goes through those steps in their decision-making process.

Going beyond the theoretical phrasing of the model, it is rational to assume that an individual should be able to describe this process in their practical daily life when they make a decision, and it is highly likely that their process would be able to be traced back to the above mentioned theoretical steps.

2.4 Consumer Behavior

To allow a connection between the Diffusion of Innovation Theory and Technology Acceptance Model linking them with the target group of this Thesis, a deeper understanding of Consumer Behavior and relevant theoretical approaches needs to be developed.

Consumer Behavior Theory is a multidisciplinary study that draws from different areas of sciences such as psychology, sociology, anthropology, economics, marketing and mathematics.

Of course, it is extremely hard to approach in depth all those different disciplines with the necessary detail and knowledge and in that sense, we will briefly touch in some of them to set the theoretical framework of the study while delving deeper into others where the area of study and scientific methods allows.

From a psychological perspective the predominant theories are Cognitive Dissonance Theory [3] developed in 1957 by Leon Festinger and the Hierarchy of Needs [4] proposed by Abraham Maslow in 1943.

Cognitive Dissonance Theory suggests that in principle, an individual strives for consistency. This consistency is related to a core system of beliefs and principles, behaviors and attitudes. When individuals find themselves being inconsistent with one of the above core elements, a psychological state that causes discomfort occurs.

This state is called “Cognitive Dissonance”, and the individual has a natural tendency to reduce or eliminate. In this effort to reduce or eliminate, individuals change their beliefs, principles, behaviors and attitudes as they want to go back in a state with no discomfort.

Within the context of Cognitive Dissonance Theory, it is theorized that during the decision-making process an individual, following a decision that is difficult or marginal in nature, experiences dissonance between the decision taken and the rejected alternatives.

This post-decision dissonance is where the individual gets in the process of re-evaluating and/or changing the beliefs, principles, behaviors and attitudes as the individual tries to increase the attractiveness of the decision and reduce the attractiveness of the rejected alternatives. It is easily understood that this process is an altering process for the individual in terms of future decisions.

Hierarchy of Needs (described in Theory of Human Motivation) on the other hand, suggests a hierarchical five level pyramid where needs of an individual are divided from the most basic ones to the higher-level ones.

According to Maslow, progression between needs is linear and sequential and is from tier I to tier V. Individuals are motivated to follow this path of meeting their needs in sequential order as the higher needs are not yet relevant to the individual without achieving full satisfaction of prior tier needs. In some cases, based on special circumstances individuals may break the rigidness of the pyramid allowing for prioritization of higher-level need over lower-level needs.

Needs in this theoretical construct that acts as a reference framework are divided into

I. Physiological Needs: Needs essential for survival such as Air, Water, Food, Shelter, Sleep, Clothing and reproduction
II. Safety Needs: Such as Personal Security, Financial Security, Health and Well-being and finally Safety against accidents and illness.
III. Love and Belongingness Needs: Friendship, Intimacy, Family, Social Groups
IV. Esteem Needs: Self-Esteem, Confidence, Achievement, Respect of Others, Recognition
V. Self-Actualization Needs: Personal Growth, Self-Improvement, Peak Experience,

In the field of economics, the theory of consumer choice has a wide range of applications as well as a vast range of theoretical approaches. In principle, the theory of consumer choice is a maximization problem where consumers, being rational, tend to maximize utility or satisfaction from a given product or service within set budget parameters. Those parameters include trade-offs, or better, compromise in their purchases based on the provided utility or satisfaction of each good or service available.

Out of a plethora of theories having a different point of view on the same matter we are going to examine some theoretical approaches that will be utilized in our subsequent methodology.

Paul Anthony Samuelson in 1938 developed Revealed Preference Theory [5][6]. Revealed Preference Theory analyzes choices made by consumers not in the sense of their stated preference but their actual choices and actions. In that sense rather than trying to draw conclusions in a given hypothetical choice or preference of an individual the study focuses on examining consuming behavior after the fact of a purchase.

Key premise of the theory is that one can conclude on a given individuals' preferences by examining their purchasing decisions and by assuming that the purchase was rational under full awareness with respect to budget constraints.

The name of the theory comes from the notion that when observing an individual, their preference is revealed the moment they make a choice.

A two-dimensional example of the theory consists of two bundles of goods (thus the two-dimensional aspect). Bundle a and bundle b. In a budget set scenario where budget is B and based on observation bundle a is selected over bundle b, then bundle a is considered revealed preferred to b. This is a directly revealed correlation between a and b.

Following the above, if there are bundles b and c with the same budget set, and the consumer selects b over c then, bundle a is considered revealed preferred to c. This is an indirect reveal correlation between a and c. The theory assumes that an individual demonstrates rational and consistent behavior among choices, and this is what allows for direct comparison between a and c that were never directly set as possible choices among the individual.

A verification of the consistency of choices for the individual exists in the form of Weak Axiom of Revealed Preferences (WARP) that states: if a consumer chooses bundle a over b when both are available reveals their preferences as a over b. There are no circumstances (budget set) that the individual will prefer b over a. The selection of a over b when both are affordable revealed the individuals' preference will always be a over b if both are affordable even if prices fluctuate.

The utilization of this theory is related to Consumer Demand Analysis. Extensive use in analyzing consumer purchases indirectly denotes relative satisfaction and/or utility deriving from goods or services. The above methods allow for prediction of future consumption behaviors and trends.

On the other hand, John Hicks and Roy Allen in 1930s proposed the Ordinal Utility Theory [7] [8]. Arguing on the principles of Cardinal Utility, Hicks and Allen suggested that it is not necessary to quantify the exact level of satisfaction but alternatively a ranking of preferences would suffice. An individual, when asked, can simply state their preference between two bundles of goods without the need to specifically describe the level of preference.

A simplistic approach on Ordinal Utility is that a consumer given bundles a, b and c, might prefer bundle a over b and b over c. This ranking is enough to act as a foundation for analysis of consumer choices.

In the scope of this thesis, a consumer with the characteristics of an Early adopter should be able to proceed by expressing their ordinal preference among products. The argument about being able to formulate this preference under the Ordinal Utility concept is based on the factor of attractiveness or satisfaction. As within this thesis and the developed questionnaire the consumer will not be asked to provide any preference based on the economic value, the ordinal utility approach is a perfect match.

2.5 Utility theory

As mentioned in the Consumer Theory section, Utility theory is one of the predominant aspects in the study of consumer behavior and formulate prediction models.

Utility theory explores consumer behavior under the concept of Utility. Utility is an economic term that sets the measure of either the perceived total value, the level of satisfaction, or the order of preference [11] of a consumer.

As consumers tend to purchase goods or services as a fulfilment of an either specific or general need, or, to simply extract enjoyment from the purchase, measurement of this fulfilment of enjoyment comes in the form of satisfaction. A consumer that perceives a total fulfilment of needs or the extraction of ultimate enjoyment from the use of a product or service is expected to also achieve ultimate utility.

To provide an example of the two different scenarios of fulfilment of needs versus extraction of enjoyment we assume a hypothetical consumer that proceeds in the following purchases:

I. The consumer purchases a gaming console. This gaming console can perform the following: play movie disks of any form, connect to the internet and allow browsing experience and access to online services, stream content from online services, allow the use of instant messaging and email services connecting the consumer with their social circle and of course allow the console to play various video games.
II. The consumer following the purchase of a gaming console decides to purchase a specific video game that offers around 20 hours of game play.

The above scenarios display in sequence that in case I. the consumer has performed a purchase that potentially responds to multiple needs such as connecting to the world, connecting to others, reproduce media in various forms etc. thus having a practical impact on the consumers daily life by responding to those needs and in case II. the consumer by use of the initial purchase follows up with a purchase that stimulates enjoyment.

Although in the above examples the basis of fulfillment is different, need vs enjoyment, by utilizing the Utility theory principles both elements can be assigned a value to represent the perceived achievement of the set parameters. This value is called Utility Value.

Under the Utility Theory, there are factors that influence the perceived utility of a product or service by a consumer. Ultimately, those factors play a catalytic role in the assignment of a Utility Value and the challenge with this process is to adequately and effectively explore the impact of those factors on a given product when performing any form of consumer analysis.

Besides the general nature of those four factors, the level of impact in the final assessment from the consumer is not standardized and each consumer for the same product might differently prioritize any and all of them.

The four factor that impact utility are:

a) **Possession Utility:** is related to the owner of the good or service. While typically possession by the consumer has a higher utility value this is not always the case. An example of Possession Utility can be seen with the possession of a book. An individual consumer might be interested in a book. This book can exist in a library or an online repository. While access to this book by the consumer is granted for a limited period either within the library or the online repository, the consumer has no possession of the actual book. In the case that this book is possessed by the consumer then the access to it has no limitations where in the opposite case, the consumer has to get access via the library for a specific time frame or use a digital device to access the online repository.

b) **Place Utility:** is related to the constraints or requirements that a product is made. A product has maximum utility when operated or consumed within the said parameters but outside the set parameters the expectations of the product's utility are much lower. A smart phone for example is primarily designed to operate under mobile phone signal coverage to ensure that it can perform incoming and outgoing calls, access the internet and get the maximum out of the supported applications. A smart phone on a remote island with no mobile phone signal cannot operate under the specified parameters. Of course, the consumer might be able to utilize some of the applications in an offline mode but the integrity of the specified use for a smart phone has been severely compromised by the non-existing signal coverage.

c) **Time Utility:** a product or service has maximized utility in time of need by the consumer. While the consumer needs the product or service, the utility will always increase. An example of this is the Covid vaccine. Within the pandemic the utility of the vaccine had its peak but if the Covid virus will steadily decline, maybe in a few years the vaccine will have no utility value

d) **Form Utility:** the physical form of a product creates different levels of utility. An electric guitar has a different Utility Value from an electric guitar kit that comes into parts. While an electric guitar comes fully assembled from the factory and is ready to play with, an electric guitar kit needs to be assembled by the consumer before playing with it. The physical form of the product itself results in a difference in the utility value of the product.

Besides the factor that impact utility there are also three constrains under which we examine the Utility output and are directly related to the level of informed decision the consumer executed.

Those constraints are related to the amount of information the consumer had in hand to make a detailed and informed decision at the time of action as well as to the relevant state of certainty or uncertainty impacting the validation of the decision. An alternative reading on the certainty factor is the level of control of the decision maker over the possible outcomes of the decision.

The three constraints set under those premises are:

a) Individual Decision Making Under Certainty
This is the typical form under which decision-making processes are examined. The decision maker understands all outputs of the decision, and it is almost an optimization argument on the process rather than a pure decision one.

b) Individual Decision Making Under Uncertainty
Decisions under uncertainty are those decisions where the decision maker cannot obtain any information or has partial or no knowledge regarding the potential outcomes.

c) Individual Decision Making Under Risk
The decisions under risk refer to the level of uncertainty and the lack of control over the outcome or consequences of the output.

It is well understood that to completely form a matrix where decisions are examined when a consumer exhibits their consumer habits or follow their decision-making pattern, we need to have a very clear understanding firstly about the conditions under which the decision is made, thus defining the level of Certainty, and then proceed with correctly interpreting the factors that impact the Utility Value of a given consumer.

In the concept of utility, we also explore utility function as the mathematical formulation that ranks the preference of an individual. This preference is expressed in terms of satisfaction that different products or bundle of products provide.

Within the Utility theory, the assumption that each individual / consumer is driven as if a utility function existed and the individual / consumer decided according to this function.

This theoretical construct holds true as an individual / consumer does not require cognitive acceptance or recognition of their own utility function. The model can still produce results even if the individual ignores or denies the existence of their own utility function.

Utility functions exist in every choice where and individual / consumer is presented with more than one option. The assumption is that individuals can demonstrate preference over two or more choices. This preference allows for some type of hierarchy or ranking among the choices presented. The expression of favor of one choice over the other as a level of satisfaction allows for a ranking order of preference.

The theory denotes that this exact ranking order has ordinal utility and thus explores relative levels of satisfaction.

The assumptions that drives Utility Function based on Utility theory is that an individual will always seek:

Completeness: All possible bundles can be ranked by the consumer. This denotes the notion that the consumer will be always capable of providing a ranking or order of preference no matter the possible combinations presented. This notion also implies that the consumer will be able to compare any bundle and express their order of satisfaction for each one.

More-is-better: This assumption is built on the notion of monotonicity assumption on preference. This means that consuming more of a product is always better. In that sense, a given individual with a preference of bundle A over B, presented with a new bundle of A' (where A'=2xA) will always prefer A' over A. Subsequently as A' is introduced as an offer to the consumer their initially stated preference A over B would become A' over A over B.

Mix-is-better: This assumption is built on the notion that bundles of goods are always better than a single offer. The Mix-is-better assumption suggests that in the event of an indifferent choice, lets say a consumer is indifferent to a choice between Apples and Oranges, would reveal a preference towards a mixed bundle of Apples with Oranges. The Apple/Orange bundle would be then preferred over Apples or Oranges alone.

Rationality: The key assumption is that all direct and indirect preferences can be correlated as direct and indirect reveals. Under the principle of rationality choices are considered set and are not re-examined as they stand true. An example of this approach would be an individual that has expressed preference of A over B. In addition, this individual has expressed preference of B over C. This allow for a direct reveal of preference where A will always be preferred over B and B will always be preferred over C. This "transfer of preference" is also applied to indirectly reveal preference of A over C. As if those choices were presented simultaneously, they would result in a preference ranking of A over B over C. Under no circumstances a consumer would choose C over A.

The level of alignment with the above assumption results in a well-behaved utility function or well-behaved preference utility function of a consumer.

2.6 Opportunity Cost and Utility Function relation

Opportunity Cost is a concept in Microeconomic Theory that measures the difference in value between a choice and its best alternative.

It accepts the fact that resources are limited, consumers are rational and can optimize their choice in a cost vs benefit relationship. Within the constraints of currency as a limited resource, this relationship of scarcity and choice would result in opportunity cost being the optimal choice given the efficient use of a scarce resource.

Alternatively, opportunity cost can be expressed as the net benefit of the next best alternative forgone or the potential forgone profit from a missed opportunity

Opportunity Cost is explored within this Thesis in terms of how frequently is considered when a choice is made from a consumer within the early adopter segment. Diffusion of innovation theory suggests that an Early Adopter has a degree of tolerance for potential financial risks deriving from their engagement with new technologies.

The above statement indirectly implies that an Early Adopter either consciously or unconsciously understands the concept of opportunity cost to a degree that is factored in their choice and is capable to potentially enhance or interfere with the principles Completeness, More-is-better, Mix-is-better and/or Rationality as matters of choice in Utility Theory.

To put the above statement into context, an example would be a newly launched product that offers less application cases than a predecessor product that is already established in the market.

Let’s assume a video game console launched by a company with no track record in the specific industry and at the time of launch and only 2 game titles available with no secured contracts for more game titles but far better technology than the directly competing game console from a well-established company that also launches the competing product within days from each other. The well-established company offers 20 game titles at launch and a secured contract for many more to come.

It is expected from Early Adopters to embrace the new console to an extent as they are prone to explore new technologies and are driven by technological advancements. As they are the first to enter behind innovators, the above example directly challenges the Mix-is-better assumption on utility theory and is one of the relations that this Thesis tries to touch upon.

As utility function does not directly factor cost, exploring the decision-making process or criteria of consumers might reveal a relation that enables an early adopter into taking this risk.

Moreover, on this matter, the stance of Early Adopters towards sunk costs would be a further area that would potentially allow a better understanding of the Early Adopter decision making process and the way they factor the potential net benefit or potential foregone profit in their decision-making process.

2.7 Bass Diffusion Model

The Diffusion Model proposed by Frank Bass [10] depicts the study on how an innovation is diffused within a population. The model offers a critical insight on the in the dynamics of technological adoption, marketing strategies and consumer behavior.

As with the other models described in the previous chapters, the Bass Diffusion Model is a framework model with a mathematical approach to on the process of how new products and innovations are adopted by a given population over a specific time frame.

The Bass model in conjunction to the Diffusion of Innovation model, segments the population in two primary groups, Innovators and Imitators. According to Bass, innovators are the first to adopt a new product and are motivated by external factors, such as the technological superiority of a product, where imitators adopt a new product at a later stage and are heavily influenced by peer pressure and social interactions. Imitators are volatile in that sense to adoption decision of others within the given population.

As a mathematic expression the Bass Model is reduced to a differential equation that predicts the rate of adoption over time and is formulated as:

$$f(t)=p+q\cdot F(t)$$

This equation includes the variables as:

- ***f(t)*** is the probability of adoption at time ***t***,
- ***p*** is the coefficient of innovation, representing the likelihood of innovators adopting the product,
- ***q*** is the coefficient of imitation, reflecting the social influence that drives imitators to adopt the product,
- ***F(t)*** is the cumulative proportion of adopters up to time ***t***.

The key factors of the model are:

Coefficient of Innovation (p): This coefficient describes the early adopters behaviour. This group is not influenced by the adoption choices of others and it is frequent that their adaptation of innovation is based in their personal needs or the perceived value of the innovation.

Coefficient of Imitation (q): This coefficient describes the imitation effect by taking into account social influence, word-of-mouth, network effects and in principle all means of diffusion to larger masses that can accelerate the adoption rate of a product as it gains traction and momentum within the market.

It is typical for the Coefficient of Innovation to have a low value around, a range of 0.01 to 0.03 is typical, indicating that a very small fraction of the population adopts a product on the merits of technological superiority, where it is typical for the Coefficient of Imitation to be generally much larger, typical ranges from 0.3 to 0.7, reflecting the fact that the majority of adopters are influenced by the decision of earlier adopters.

The Cumulative Adoption Function F(t): This function depicts the proportion of the total population that has adopted a specific innovation by the time t. The model of Bass, follows an S-Shaped curve. This curve explains the initial slow rate of adoption in the beginning primarily driven by innovators. The more people adopt, imitation accelerates the adoption rate coming to a saturation point where the majority of the population has adopted the innovation

The model provides some crucial insights into the process of an innovation spread within a given population. The relation between innovation and imitation is the key to explore product adoption. This relation builds on the crucial aspect of innovators that kick-start the diffusion process while imitators drive a product to widespread adoption.

Moreover the Bass model is applied in the forecast of a product life cycle allowing the developers of each product to explore the rate of adoption, the point in time where widespread adoption will be achieved and adjust marketing strategies and market penetration techniques accordingly.

In addition the model allows exploration of the relationship between values p and q offering some degree of calculation between the approach established for tackling early adopters and the targeted word-of-mouth and/or social diffusion within a set population.

Related to the model's application is the limitation in application on the ground of assumptions. While the model is simplistic and effective, a key assumption in application is the consistency of the population. The model assumes a homogeneous population where the probability of adopting the innovation is equal in the entire population. In reality a population is segmented by considering factors such as income, social status, geographic location and many more that affect the adoption rates either positively or negatively. One more assumption of the model is that an individual adopting the innovation, will remain an adopter permanently. There is no prediction or factor with the model for an active adopter dropping the specific product in favor of another either due to obsolescence or irrelevance due to other advancements of other products.

A turning point in the use of the model is the fact that the model does not explicitly take into account for any external elements such as competition, volatility of price and price fluctuations, technological changes that can interfere or accelerate the diffusion process. In practice the model tends to follow a prediction on the diffusion process in a closed system with given parameters and does not easily steer the changing environment of everchanging environment where innovations continuously launch.

2.8 Summary on the theoretical framework

By exploring the above-mentioned frameworks, we take a deep look at the cornerstones of clustering and segmentation of user groups. It is apparent that even different models accept the segmentation based on the point of entry in time for a consumer to a new technology to assign the said user into a specific segment.

The point of entry is also examined in the level of influence a consumer's choice was a matter of "social pressure" or not. It is apparent from the different models that the earliest a consumer accepts a product the less likely is that their decision has been a genuine product of individual analysis and has not been biased by any social pressure / peer pressure, trends of any short or any other means of influencing.

All three predominant framework models, Diffusion of Innovation Model, Technology Acceptance Model and Bass Diffusion Model, directly or indirectly accept a relation of intergroup influence. Within the set groups/populations there is always a dynamic of individuals who explore early an innovation and then other segments follow. The catalyst is the relationship between the early groups and the other groups in terms of influence from the one to another.

The differentiation of each model is in the attempt to quantify this influence in terms of social elements. As Diffusion of Innovation Model suggests, it is highly likely and confirmed by also relevant studies that the higher the social status and the bigger the social circles are the higher the chance to influence exponentially more individuals into accepting the said innovation or product.

Building on this observation the models suggest that the level of analysis in the decision-making process shifts from primary decision-making criteria to more relaxed decisions driven by social acceptance and alignment with a social trend.

In that sense it is expected from the earlier adopters of a technology/product to have a high level of understanding on all the aspects of the product/technology as well as on the utility and the level of fulfillment of needs where latter adopters are not that aware on those aspects.

It is within this Thesis scope to identify at least a level of understanding of those elements from the consumers, to assist in their classification other than the pure criteria of social status, income, level of education etc. An approach to measure this level of cognitive decision-making process based on their capacity to identify the level of fulfillment of needs and utility is proposed.

Chapter 3. Formulating the methodology

This chapter explores and formulates the methodological framework under which the development of a structured questionnaire will be the result.

By utilizing different theoretical approaches as laid out in chapter 2, we attempt to combine elements from different frameworks allowing for a synergetic approach and possibly a deeper look into the decision-making process of early adopters.

Firstly, the methodology will focus on setting the parameters that can identify a potential early adopter within demographic, educational and financial criteria. Secondly, the methodology will try to further refine the potentially identified early adopter by testing criteria such as the level of remorse in decision making patterns, the level of informed decision-making processes and the degree of alignment into the Early Adopters profile as set by Diffusion of Innovation Theory. Finally, this methodological approach will try to test the level of understanding of a consumer to the alternatives.

In conclusion to this chapter's introduction, I would like to mention the fact that this methodology remains theoretical and experimental in terms of usability under some constraints that will be further displayed in following parts of this chapter.

Though the key reason is that the proposed methodology has a very narrow window of application to either prove or disprove the concept. This window of application is related to a new product launch onto the market. The set parameters for testing the questionnaire are related to a product with undisputed novelty factors, where the new technology has a level of complexity that only familiarized users can explain adequately and requires a level of commitment from the consumer to engage to this technology.

Practically, elements from the profiling of Early Adopters from Diffusion of Innovation Theory were taken into account when developing the questionnaire and the application scenario and a side goal of the questionnaire besides the already stated main objective above, is to filter out consumers that although the point in time where they accepted and purchased a new technology product is inline with the Early Adopters segment, their profile fails to align with the set target group. Those may be considered outliers or consumers driven by other motives that would have otherwise been misclassified in the segment.

3.1 Profiling and Setting Parameters

In the profiling process we set the parameters from the theoretical frameworks, and we try to identify if any of those parameters can be tested or not. This process will provide the fundamental structure of the identification factors included in the structured questionnaire.

Diffusion of Innovation Theory offers a deep understanding of the Early Adopters cluster and sets the fundamentals of their profile. Over the years and no matter that the technology has drastically changed those characteristics remain the core of the Early Adopters profile. In this respect the descriptors of their profile have been included in a table with a logical binary argument of "allows testing YES / NO". This logical binary argument is either a qualitative or quantitative approach to allow us to verify those descry\ptors.

Early Adopters – Diffusion of Innovation Theory Characteristics	
Characteristic	**Allows Testing?**
1. Localites	YES
2. Great degree of opinion leadership in most social systems	NO
3. Potential adopters seek advice and information from	YES
4. They can accelerate the diffusion process	NO
5. Looked at as role models	NO
6. Esteemed by their peers	NO
7. Want to retain this position	YES
8. Perform judicious innovation decisions	YES
9. More years of education that later adopters	YES
10. Highly likelihood of being literate	YES
11. Higher Social Status	YES
12. High degree of social mobility	YES
13. More positive stance towards credit	YES
14. High likelihood of having commercial economic orientation	YES

Table 1

Following table 1 we have identified ten characteristics that can be directly tested and four characteristics that cannot be tested. The characteristics that can be tested can be either directly asked in the structured questionnaire or indirectly asked allowing a correlation to the characteristic. Though, the characteristics that have been identified as not able to be tested are characteristics that are not related to the individual potentially responding to the questionnaire. They are characteristics that only other individuals would be able to verify for the individual in question.

Asking the individual taking the questionnaire directly or indirectly if they are looked as role models provides a strongly subjective perspective of themselves that cannot be verified at all and cannot be considered as a definite response to conclude.

Those types of characteristics can only be validated by an individual with the capacity to assess if any statement in this regard is true or false for the individual in question.

Though, some of the above characteristics that are not deemed as being able to be tested in the structured questionnaire, indirectly they can still be included and only be considered as mildly indicators for consideration.

The characteristics presented in table 1 can produce the following possible testing conditions:

1. **Localites**: this characteristic can be tested by directly asking the individual about their tendency to travel as well as if they have selected a steady living place rather than the opposite cosmopolitan lifestyle.
2. **Great degree of opinion leadership in most social systems**: this characteristic has been deemed as not allowing testing as the output of any response cannot be verified without external contribution from another individual. Though, a mild indicator could be extracted from the tendency of the individual to express themselves in relevant matters within their social circles.
3. **Potential adopters seek advice and information from**: this characteristic can be tested by extracting information from the individual about the frequency others reach out for their opinions as well as how often others seek information on a topic they closely follow.
4. **They can accelerate the diffusion process**: this characteristic is again extremely hard to measure without contribution of external individuals. Though a mild indicator would be the amount of effort, the individual in question is putting in disseminating the innovation thus indicating some level of contribution to the acceleration process.
5. **Looked at as role models**: it is highly unlikely that an individual can respond to this question as the response would be biased by personal beliefs. Again, external validation from another individual could definitely confirm if they are looked as role models or not. Though, an indirect approach could mildly suggest that the individual in question could be of that status.
6. **Esteemed by their peers**: this characteristic exhibits the same complexity in having a definite output without external validation. An indirect approach can again give mild indicators for consideration.
7. **Want to retain this position**: The characteristic in question is simplistic in validation. The individual just needs to respond to a statement prompting a positive response related to their status. If the individual responds that they wish to retain their current position without any change then this is a definite output.
8. **Perform judicious innovation decisions**: To address this characteristic the individual should express their confidence in taking informed innovative decisions. They should be able to give a relative measure to the level of comfort with their decision-making abilities and trust in the output of their decision.
9. **More years of education that later adopters**: simplistic in nature this characteristic can be measured by a direct response on the level or years of education.
10. **Highly likelihood of being literate**: Besides the years of education or level of education, the individual could provide information on the frequency of study on various topics, training outside formal education, activities that include the broaden of thought process and accumulation on new knowledge.

11. **Higher Social Status**: A direct and indirect response to the social status can be extracted from the individual by combining the level of income, role within their organization, size of social circle etc.
12. **High degree of social mobility**: A direct response to this characteristic can be extracted by facts of being an introvert or extrovert and the degree to which they participate in various social activities, the extent of their social circle etc.
13. **More positive stance towards credit**: Measurement towards credit can be achieved by a direct approach of allowing a measurement to their credit tolerance as well as their credit status.
14. **High likelihood of having commercial economic orientation**: This characteristic can be addressed by identifying the individuals' orientation in a direct manner.

In addition to the characteristics defined in Diffusion of Innovation we can accept the following assumptions from the different theoretical frameworks.

An early adopter, due to the amount of research put into a specific topic, can perform calculated decisions on the acceptance and onboarding of a technology. It is expected of the Early Adopter to be able to identify different elements of Technology Acceptance Model no matter their familiarity with the model.

This expectation derives from the rational notion that a cognitive informed decision should be able, when explained, to navigate through the process of Perceived Usefulness and Perceived Ease of Use as potential applications of the technology should be part of the informed decision. In this respect a consumer in this cluster should be able to articulate the elements that comprise PU and PEOU no matter if they do it in a free and not structured theoretical context.

In addition, it is also expected that an Early Adopter will be able to set at least some utility values to the selected product for purchase as well as the competition, again with the acceptance that they should not be able to articulate it theoretically, if they can identify the difference between the products and the additional or missing features. That notion is supported again by the fact that Early Adopters operate in a context of Certainty thus all outputs in their decision are measurable and can be described if the Early Adopters is asked about the potential different decision outcome.

The above said parameters will be utilized in a broader context in the structuring of the questionnaire and explained when used in a specific question.

Finally, Early Adopters are not depicted in bibliography as consumers that experience any form of distress following their purchases. The only set-back can be potential financial impact but based on the level of financial liquidity of Early Adopters this can easily be overcome by them without causing any discomfort. In this respect, indicators that could hint strong buyers' remorse or discomfort that could subsequently associated with cognitive dissonance would produce an indicator that the consumer is not part of the cluster. It is only an assumption that Early Adopters have undergone multiple stages of adjusting their beliefs as in Cognitive Dissonance Theory but at the stage that they get to be clustered as Early Adopters, they appear to have solidified their opinions and beliefs in a way that they are not easily shaken or adjusted.

3.2 Proposed Application

The proposed application of the questionnaire includes two phases in person in the form of interviews. The questions will be asked by the person collecting the questionnaires and the consumer will be prompted to give the responses.

Phase 1 is a pre purchase study of the individual willing to proceed with a purchase of a technological product. Ideally this would take place in a physical store. In modern society, where electronic commerce is massive, and most of the consumers make their purchases remotely, it is of course less effective to select the physical store as the appropriate place for the study.

Though due to the nature of the proposed application, a consumer should engage with a pre purchase questionnaire setting a base line on their planned purchases allowing for a direct comparison of the results following the purchase with a post purchase questionnaire.

The fact that we are selecting a store means that the consumer in question has broken all the barriers described in the Technology Acceptance Model has gone through all stages of planning, adjusting and setting their mind and is now in the act state.

The pre purchase questionnaire will allow to measure Perceive Usefulness and Perceived Ease of Use. At the same time the consumer will be presented with the competitive alternatives asking them to assign utility values to the presented alternatives and to also state their order of preference.

Finaly, the consumer in question will also be asked to identify the additional benefits of the new product compared to the competition by directly comparing them to the cost of each product. In this sense indirectly the consumer will demonstrate their understanding of opportunity cost compared to their intention to purchase.

Following the pre purchase questionnaire, a post purchase questionnaire will be completed by the consumer at their exit.

The post purchase questionnaire will include general information of the consumers' profile such as demographics, income, social status etc. It will also compare the intention of the consumer to purchase with the actual purchase and any potential deviations.

The post purchase questionnaire will also include questions related to "buyers' remorse" if something changed following their purchase and exit from the physical store.

In theory the consumer should be ready to execute their planned purchase without internal frictions and the purchase should be followed by a feeling of accomplishment, enjoyment or fulfillment. A negative feeling should denote that processes related to Cognitive Dissonance and should further denote that the consumer did not factor all parameters for the purchase.

Such an indicator would also be factored in the overall assessment of the questionnaire as theoretically, based on Diffusion of Innovation Theory, Early Adopters take a calculated

risk in a new technology where in case the purchase of such technology been unfavorable, there is only financial impact that can easily be covered by available financial liquidity.

There are multiple fronts and approaches that the questionnaire tries to tie together from different theoretical models though all of these approaches are interlinked in the sense of decision process of a consumer.

As answers to identify why Early Adopters act the way they act and follow a specific purchase decision making process, it is logical to try and identify as many elements of the process as possible.

The proposed application needs to take into account serious planning to execute in multiple levels. This is the key reason why this remained only as a theoretical approach and has no proven application with results from actual consumers.

To identify the Early Adopters with the proposed methodology and application, a candidate product needs to be identified. The product needs to have a significant amount of novelty in the included technology but to also have some direct or indirect competitors where consumers can directly relate as suitable substitutes. The candidate product needs to have some kind of financial impact to purchase as a low-cost product that everyone can buy would not allow enough time to differentiate between consumers purchasing it. It will be extremely hard to time the questionnaire in a low-cost product with minimal financial impact deriving from the purchase as innovators, early adopters, late adopters and the rest of the clusters would have no barriers to purchase this product.

A good example of a candidate would have been the launch of Apple Vision. At the first days of launch the questionnaire could have been utilized in an Apple store and produced measurable results.

The reason of selecting Apple Vision as a good theoretical candidate is the amount of novelty, the existence of some form of competition although not directly related to the value proposition and the fact that large number of consumers prefer to purchase it physically in Apple Stores. Moreover, the larger the number of consumers willing to purchase and visiting the physical stores would ensure enough candidates to reach a safe number of participants in the study to produce safe to use metrics and results.

To ensure that a consumer will participate in both questionnaires, following the completion of the pre-purchase questionnaire, the consumer will be given a token with a unique number that will be noted in both questionnaires and will also be needed to return to the person who is facilitating the interviews.

As an additional incentive, the consumer taking the questionnaire may receive a type of coupon for the store the interview takes place in as long as the coupon offers an irrelevant to the planned purchase benefit. It can be a 10 Euro discount in the next purchase coupon or something similar in nature.

It remains open within the application parameters for contact details of the consumer to be gathered in the event further research should be undertaken. In the event a consumer is deemed as an Early Adopter it might be of significance to participate in various follow-up studies to further explore their consumer behavioral traits.

3.3 Structuring the Pre-Purchase Questionnaire

As mentioned in the proposed application section, the pre-purchase questionnaire needs to be product specific. In the above sense it is unsafe to formulate a rigid questionnaire that is guaranteed to not have any changes though the key nature of the questions can be defined.

Following the above statement the outline of the questionnaire should include the product set to purchase, the input of the consumer on identifying the competition / competitive products to the one set for purchase, the order of preference to those products and various other elements.

The Questionnaire should follow a similar outline to the proposed structure below:

1.1 Do you plan to proceed with a purchase today?
Response here

1.2 What is the product you are willing to purchase today?
Response here

1.3 Do you know of any alternatives / competitors to the product you wish to purchase today? If so, can you name the alternatives?
Response here

1.4 Out of the competition named above, could you express your order of preference to those products?
Response here

1.5 Can you describe the level of research you have done related to this product?
Response here

1.6 Can you name the competitive advantage of the product that made you decide on the purchase of this product instead of the competition?
Response here

1.7 Do you expect any financial setbacks from your purchase? Are there other priorities postponed proceeding with the purchase?	
YES	NO

1.8 What are your expectations from the product related to the use you intend?
Response here

1.9 Can you describe the level of satisfaction you expect the purchase to bring related to the use you intend?
Response here

1.10 Do you believe that the difference in price justifies the additional functionality or extended use of the product?	
YES	NO

1.11 Is there a real application scenario in your daily life that justifies the additional cost?
Response here

1.12 Is there an application scenario that you believe this product would be great for but is not currently?
Response here

1.13 Can you describe how useful you believe the product to be and how this applies?
Response here

1.14 Can you describe how easy to use you believe the product to be and how that helps in your intended use scenario?
Response here

1.15 What is your age, and do you believe that the product is age specific or not?
Response here

The above set of questions are intended to identify all elements of the intended purchase to the extent of perceived use, ease of use, utility and preference as well as offer an insight into the level of research and planning the consumer went before solidifying the decision to purchase.

It is expected that Early Adopters will be able to respond to the questions above in detail about their preparation, defining the competition, providing ordinal preferences on the product and competition as well as articulate potential use case scenarios in a more extensive way. The expectation to provide use case scenarios in extend derives from the level of knowledge about the specific product or technology application. The more familiar the consumer is with the product the more likely to provide adequate justification and detailed arguments to support their decision.

Of course, the nature of the pre-purchase questionnaire is qualitative in nature where qualitative methods[9] analyzing the responses should be employed, but the ultimate criterion in the analysis of the responses is only going to be the familiarity of the consumer with the nature of the concepts in questions, their ability to adequately respond to them and to identify the early tell signs of an Early Adopter.

The pre-purchase questionnaire aims to filter out consumers who purchase a product based on impulsion, ignorance, lack of decision-making process, forced decision or extreme social pressure and in general set mild indicators on the potential of a consumer to identify as an early adopter.

Question 1.1 – Checks the consumer state. A positive response to this question denotes that some type of decision preexists the interaction with the interviewer. A negative response denotes that the consumer has no intention of making a purchase and in that case, they might be vulnerable or open to an impulse purchase. In terms of analysis, a positive response in this question would have a score of 1 while a negative response a score of 0.

Question 1.2 – Checks the consumer determination in purchasing a specific product. In the event of a positive response where a product is named, then the consumer has set their mind, and some type of decision has been made prior to the interaction. If a negative response is given, then the consumer has not made up their mind and is either willing to decide within the store or proceed with an impulse decision based on questionable factors. A positive response in this question would receive a score of 1 while a negative a score of 0.

Both questions 1.1 and 1.2 receive a score of 1 in case of a positive response as they are those material questions that denote the consumer has put some effort into thinking their purchase and has explored through a logical process their intention of buying while exploring the alternatives. This is in line with the general profile of an Early Adopter that is highly likely to have made their mind days prior the purchase rather than not.

Question 1.3 – Checks the knowledge of the consumer to viable alternatives in terms of the selected product. A consumer with a good understanding of the product should be able to articulate any or all the alternatives. A consumer that has spent no time understanding the product should not be able to provide any alternatives or have a difficult time naming any of them. The ability to name alternatives to the product should receive a score of 1 while the opposite should receive a score of 0.

Question 1.4 – Checks the Ordinal Preference of the consumer. If the consumer has done some research should have knowledge of alternative products and have already gone through the process of comparison during their decision. Being able to express with a level of confidence their Ordinal Preference should verify that the consumer is proceeding with a cognitive purchase. A response where preference is stated should receive a score of 1 while the opposite should receive a score of 0.

Question 1.5 – Checks the level of research the consumer has done prior to the purchase. Research from their end exploring alternatives denotes the ability of the consumer to compare products based on their merits. A response from the consumer that primary research on their end has been carried out would receive a score of 1 while a response denoting that the consumer has not done any primary research but is based on the words of others should receive a score of 1.

Question 1.6 – Acts as a follow up question to 1.5. A consumer who has performed primary research or has put the time and effort to decide on the merits of a product should be able to define the competitive advantage of the product selected. A response that adequately describes any or all the competitive advantages in a valid should receive a score of 1 while the opposite should receive a score of 0.

Question 1.7 – Checks the rationality behind the purchase. A rational consumer should not jeopardize their financial stability to proceed with a purchase while a hard to recover from financial impact is imminent. In that sense, if the consumer states that a big financial hit is expected to follow the purchase that would block the consumer from fulfilling other needs this

response should receive a score of 0 while a response denoting that the financial risk is calculated and no imminent threat to financial liquidity comes from the purchase should receive a score of 1.

Question 1.8 – Sets the expectation level of the use. This question aims to set a baseline for measurement. This question was used as an introductory question to question 1.9. The ability to describe the expectation receives a score of 1 while the opposite receives a score of 0.

Question 1.9 – Sets the level of the expected satisfaction. This is to establish a pre-purchase satisfaction base line to compare with potential future interactions with the consumer. This question tests the ability to strongly demonstrate that there is an expectation of satisfaction from the consumer. A response with measurable expected satisfaction receives a score of 1 while the inability to respond should receive 0.

Question 1.10 – Is a yes / no question. It sets the measure to demonstrate the ability of the consumer to understand opportunity cost and justify their decision in a follow-up question. A yes response should receive a score of 1. A no response should receive a score of 0 and should also denote irrational decision pattern. No rational consumer and specifically an Early Adopter would proceed to a purchase where the product price does not seem logical or justified. It would be argued that this could also be an automatic exclusion criterion, but it will be factored in part 6 of this chapter.

Question 1.11 – Allows the consumer to elaborate on their willingness to purchase the product having an extra cost to the competition. A reasonable justification in a real-life scenario should receive a score of 1 where the inability to demonstrate a scenario should receive a score of 2. This is also related to the opportunity cost where consumers could justify the purchase and sacrifice of financial resources.

Question 1.12 – Tests the consumers' ability to think beyond the commonly known application of the product. A response where the consumer can define an application like that means that the consumer has logically tested future scenarios and factored within their decision. A positive response should receive a score of 1 while a response that shows inability to do so should receive a score of 0.

Question 1.13 – Tests the perceived usefulness. A consumer such as an Early Adopter has undergone the process of assigning value like this to a product during their acceptance of technology stages. It should be easy for a consumer to define this if the decision is cognitive. A positive response should receive a score of 1 while the opposite score of 0.

Question 1.14 – Tests the perceived ease of use by the consumer. Similar in process with question 1.13 a consumer gone through this process should be able to respond with confidence. A positive confident respond should receive a score of 1 while the opposite 0.

Question 1.15 – This is a demographic question to include the age of the consumer as a factor. As early adopters have a defined representation within a specific age group this should be an additional indicator of a possible match. This should only receive a positive score in comparison to the Early Adopters current demographic.

3.4 Structuring the Post-Purchase Questionnaire

In this section each question is formalized, and an explanation of the rationale is also provided. Following each question, the assigned score to each response is also stated and justified. It is also attempted to link each question to the characteristics of section 3.2 when possible. Where multiple characteristics are addressed by an individual question then the general context or goal of the question is provided rather than the specific characteristic.

2.1. What is your educational background?				
Basic Education	Technical Education	Batchelor's Degree	Master's Degree	Doctorate
Score: 0	Score: 0	Score: 1	Score: 2	Score: 3

Question number 2.1: provides enough detail to address the **More years of education that later adopters** characteristic and a mild indicator to potentially hint towards **Highly likelihood of being literate.**

As the basic education and technical education does not satisfy the criteria for having more years of education, both have been assigned a score of 0 while Batchelor's Degree scores 1, master's degree scores 2 and Doctorate scores 3.

2.2. How often do you update your knowledge related to technology products and new technologies?				
Daily	Twice a week	Weekly	Monthly	Not on a schedule
Score: 3	Score: 2	Score: 1	Score: 0	Score: 0

Question number 2.2: provides an insight on the systematic study of technology by the individual backing the knowledge factor related to having deep understanding on the innovation aspect as well as mildly supporting the **Highly likelihood of being literate** characteristic. Delving into new knowledge suggests some level of exposure to the development of new knowledge as well as having general literacy to combine information.

Daily update gets a score of 3 as it suggests a systematic approach on the accumulation of information on the matter, twice a week shows some level of commitment and an attempt to add this in the individuals' routine thus getting a score of 2. Weekly receives a score of 1 as it is considered the bare minimum to stay in touch with the scene and receive adequate information. Monthly and not on a schedule both receive a score of 0 as Monthly does not qualify as staying updated and not on a schedule denotes an opportunistic approach on the information received.

2.3. What is your primary source of information related to technology products and new technologies?					
Forums	Social media	Technology Magazines	Technology websites	Technology communities	Other Individuals
Score: 2	Score: 1	Score: 2	Score: 2	Score: 3	Score: 0

Question number 2.3: is structured in a way to identify the primary source of information for the individual. As sources of information with higher score have been deemed those who engage individuals in form of communities as they enhance the characteristics of early adopters in the sense of having social interactions whenever possible as well as the characteristics of **Great degree of opinion leadership in most social systems** is supported by means of information that enhances interactions with other knowledgeable individuals. Though Early Adopters are known to be active in social media, information on social media is highly biased and randomized. The expectation that a highly motivated individual with a deep understanding of a topic receives passive information without filtering is highly unlikely. Last but not least, the more complex the source of the information the more it enhances the literacy characteristic as higher literacy would suggest a deeper dive into available information.

2.4. Related to information about a new technology product or new technology from the above sources, do you spend extra time researching?				
I do not spend more time researching	I spend few minutes on other sources	I reference with other sources and spend a few hours	I spend enough time to briefly understand the product or technology	I spend enough time to fully understand the product or technology
Score: 0	Score: 0	Score: 1	Score: 2	Score: 3

Question number 2.4: aims to further explore the learning process of Early Adopters. The amount of study in a new topic is indicative to the commitment this group has in understanding the complexity and elements of an innovation or novelty. The premise that Early Adopters just accept things for granted in terms of information is not supported by any framework and instead the are portrayed as individuals with the natural tendency to deeply understand all elements surrounding that novelty. Moreover, as Early Adopters are able to further influence other individuals their ability to communicate a concept is highly connected to the information accumulated by them. The lower the effort to accumulate information the higher the chance that the individual is not part of the Early Adopters cluster. Finally, as Early Adopters have been also deemed as opinion leaders it is highly unlikely that they are able to articulate any opinion with lack of research.

Questions similar in nature respond to multiple characteristics thus deeming such type of questions valuable to the extent of validating or not the characteristics of Early Adopters.

2.5. What do you consider as a new technology innovative product?			
A novelty product that was not available in this form	A product that has been updated with some new features	A product that is newer than the one I have	All of them
Score: 3	Score: 2	Score: 0	Score: 0

Question number 2.5: tries to identify the individuals' perception of a novelty concept and in general test their understanding of innovation. Although questions might seem simplistic in nature, they have been deemed adequate to provide an insight in the characteristics of the individual. A score of 3 has been assigned to the most complete response where a score of 2 has been assigned to the response that might be true depending on what the new features are. In that sense selecting the new features as a response the individual demonstrates their ability to potentially think that those new features might hint towards innovation. The other questions receive a score of 0 as they display the inability of the individual to successfully identify the concept of innovation.

2.6. How large is your social circle? (Exclude family members and indicate the number of individuals that you frequently interact with)			
Less than 10	Between 10 and 50	Between 50 and 150	Larger than 150
Score: 0	Score: 1	Score: 2	Score: 3

2.7. Related to new technology products and new technologies, how often do you discuss those topics with your social circle (Exclude family members and include only individuals that you frequently interact with)			
I have daily conversations about technology products and new technologies	I might have a conversation weekly	I might participate in a conversation once or few times within a month	Not frequent
Score: 3	Score: 2	Score: 1	Score: 0

2.8. Related to the above question do you initiate such conversations, or you participate in these conversations only if they are initiated by another person?		
I am mostly the initiator of those conversations	I do initiate those conversations, but it is frequent I do not initiate	I like to join such conversations, but I almost never initiate
Score: 3	Score: 2	Score: 1

Question number 2.6, 2.7 and 2.8: aim to identify the extent of the individuals' social circle. The numbers are targeted to identify how extensive the interactions with others. At the same time the follow up question is targeted to identify the level of engagement of the individual to conversations related to the topic. This tackles the **great degree of opinion leadership in most social systems** characteristic as well as, **they can accelerate the diffusion process** characteristic. The response to those questions provides a strong indicator on the social position of the individual in question as well as the dynamics in their social circle related to diffusion. Question number 8 tries to identify the level of engagement and the impact as initiator. Early Adopters tend to be the catalysts in the diffusion of such products thus the higher the initiator chances the higher the match with the profile is.

Scores in questions 2.6, 2.7 and 2.8 have been assigned based on the impact of the response. Highest score means higher correlation with the profile while lower score denotes dissociation from the Early Adopters profile.

2.9. Could you describe the level of confidence with which you can describe a new technology product or new technology to an individual of your social circle?			
I am confident in deeply describing the technical elements, innovations, application differences as well as the competitive advantages over competing products.	I am confident in providing a high-level outline of the technical elements, innovations, application differences as well as the competitive advantages over competing products.	I can only describe what I have read / been informed about the product without a clear understanding of the technical elements, innovations, application differences as well as the competitive advantages over competing products.	I don't feel confident providing any information about a new technology product or a new technology
Score: 3	Score: 2	Score: 1	Score: 0

Question number 2.9 – aims to identify the level of adequacy of the consumer in question, to perform a vital role of Early Adopters. To further diffuse information about the technology to others. The level of confidence to describe the technology adequately is crucial in this. Score has been assigned from the most adequate to less adequate description with the last one receiving a score of 0.

2.10. How often is it that our social circle asks you for information about new technology products or new technologies?		
I am often their first point of contact when they seek information about a new technology product or new technology	It is frequent that following their research they ask my opinion about it	It is not often for my social circle to ask information from me
Score: 2	Score: 1	Score: 0

Question number 2.10 – aims to identify the role of the consumer within their social circle related to diffusion of the product and opinion leadership. Maximum score is 2 if the consumer is the first point of contact for other to seek information while the score reduces the less frequent it is for others to seek information from the consumer in question. A score of 0 is assigned to the consumer in the event that is rare for others to seek advice.

2.11. What is your yearly individual income?				
Below 15.000 Euros	Between 15.000 Euro and 30.000 Euro	Between 30.000 Euro and 60.000 Euro	Between 60.000 Euro and 120.000 Euro	Above 120.000 Euro
Score: 0	Score: 0	Score: 1	Score: 2	Score: 3

Question number 2.11 – sets the income level of the consumer. It is known that Early adopters are of a higher income status. The higher the income the higher the relation with potentially being an Early Adopter. The income range could be adjusted based on the current economic situation in the country. Lower incomes receive a score of 0 as it is highly unlikely that they meet the Early Adopters criteria.

2.12. What is your average expenditure in technology products			
Below 5% of my income	Between 5% and 10% of my income	Between 10 and 15% of my income	Above 15% of my income
Score: 0	Score: 1	Score: 2	Score: 3

Question number 2.12 – measures the extent of expenditure of the consumer. As Early Adopters are heavily invested in technology, it is expected that the higher the expenditure on technology the higher the chances of a positive relation to Early Adopters.

The last set of questions are related to the pre-purchase questionnaire and are in place to validate or invalidate the initial statements of the consumer.

2.13.a Did you purchase the product that you had set in mind when coming here?	
YES	NO

2.13.b Why did you change your mind?

2.13.c Did you purchase an alternative and if so which one?

Question number 2.13 a to c – these questions aim to verify the initial intention of the consumer and ensure that the initial decision materialized. If the response in this question is Yes, then it receives a score of 1. In the opposite case it receives a score of 0. The justification in Question 2.13b exists to explore the rationale for the change of the initial decision. Question 2.13c exists in the event an alternative was selected. In the event an alternative was selected we can assume the alternative as Direct Reveal Prefer over the initial product. Questions 2.13b and 2.13c receive no score.

2.14. Following your purchase do you still believe that the difference in price justifies the features of the product?	
YES	NO

Question number 2.14 – aims to solidify and verify the selection of the product over the competition in terms of opportunity cost understanding. A YES response receives a score of 1 and validates the decision and a NO response receives a score of 0 and invalidates the decision.

The proposed analysis of the post-purchase questionnaire follows in part 3.6.

3.5 Proposed analysis of the result

The proposed analysis of the results from the pre-purchase questionnaire is based on the ability of the consumer to clearly define their decision process as well as to demonstrate that the fundamental process of exploring possible outputs in their decision process were explored.

As stated in part 3.4, the pre-purchase questionnaire is present to filter out consumers that would not fit the profile of an Early Adopter. The structure of the pre-purchase questionnaire is to measure the composition of the consumer and the level of effort and thought in the targeted purchase. A cognitive calculated decision should exhibit all the elements of a process factoring all parameters.

Ultimately, the existence of the pre-purchase questionnaire is to test rationality in the decision, the level of information associated with the decision, the ability of the consumer to justify the cost of the purchase, the expectation of a solution to the consumer buy acquisition of this product and finally the display that the initial trigger for the purchase derives from the individual based on information gathered on their own rather than a purchase to achieve social status or to mimic a general trend.

In total of 15 questions in the pre-purchase questionnaire, 14 are receiving a score. There are three possible output ranges based on the score of the consumers.

Scenario A: A consumer that receives a total score of 14 strongly signals the characteristics of performing a well calculated decision, understanding the alternatives and still engaging into the purchase. Their ability to execute this informed decision and respond to the questionnaire also suggests that they can potentially effectively communicate the product to other consumers. It is an expectation from Early Adopters to be able to adequately communicate such information to the masses. This is an additional indicator for their potential classification. In this event the response of question 1.15 should be examined in conjunction with the current demographic of the group further verifying the potential match.

Scenario B: A consumer that receives a score between 10 and 13 demonstrates the basic characteristics of the target group. The chance of a consumer within this score range is high but further analysis. The consumer demonstrates a relevant ability to justify their upcoming purchase and elements of a proper decision-making process are present. In the event of positive response to questions 1.7 and a response that suggests a tendency to decide on the spot with an impulse in question 1.2, the consumer should be excluded from consideration as Early Adopter. It should also exclude from consideration a response to question 1.5 displaying that the consumer is volatile to purchase based on the opinion of others rather their own opinion.

Scenario C: A consumer that receives a score of 9 and below displays weak correlation to the target group and is highly unlikely to be part of the Early Adopters cluster. The same exclusion criteria apply as in scenario B.

The analysis of results from the post-purchase questionnaire has two levels. Initially to identify potential Early Adopters out of the crowd and secondly, to further analyze the responses in terms of decision process and understanding the products value proposition.

There are 12 questions that follow a score model. The maximum score on the questions one can achieve is 35. Question 2.13a can also add an additional point in the event pre-purchase questionnaire and post-purchase questionnaire had no deviation in the intended to purchase product.

Scenario A: If all 35+1 points are scored, then the probability of the consumer being an Early Adopter is extremely high. To achieve this score the consumer has demonstrated their ability to articulate themselves and justify various elements of their decision. It is relatively safe to assume that the consumer spends time researching the topic of similar technology in a regular base, is a point of contact for others in their social circle to seek information, their economic status is relatively high and spend a significant amount in technology products in a regular basis. Moreover, the said consumer can understand the technology in depth and communicate it further allowing the product diffusion in their social circle. It is also safe to assume that the consumer is esteemed within their social circle with solid opinions.

Scenario B: For scores between 22 and 34, it is likely that the consumer is an Early Adopter the higher the score the higher the likelihood of being one. It is relatively safe to assume that the consumer scoring in this range, is a person who can demonstrate a good understanding of the technology and communicate it to others, there is some type of influence from the consumer to their social circle. There is also some type of opinion leadership for the individual. It would be safe to assume that the consumer can perform calculated decisions and analyze the possible outputs to an above-average standard.

Scenario C: For scores lower than 22, it is highly unlikely that the consumer is an early adopter. There is a high chance that the consumer in question failed to demonstrate some of the abilities an Early Adopter has. The consumer has a basic understanding of technology and limited social cycle. Financial liquidity might also be an issue and solid opinions might not have yet formed. The consumer might be prone to follow the opinions of others and the consumer behavior is unpredicted in some short.

On the specifics of each question analysis, following the rationale in part 3.5, individual analysis of each question can output areas to produce further findings. Qualitative criteria such as the frequency of interaction with their peers and social circles might derive, the level of effort into staying updated with the technology, the level of confidence in diffusion of the product to others within their social groups etc. Moreover, primary sources of information and the quality of information can also be extracted as well as the economic commitment of the target group to technology products.

Chapter 4. Conclusion

Although the proposed methodology comprises of two separate questionnaires, a pre-purchase and a post-purchase, with the first one having open ended questions and the second having closed questions with pre-defined scores, each questionnaire serves a unique purpose.

The pre-purchase questionnaire, although it comprises from qualitative elements aims to measure the level of confidence from a consumer in identifying crucial descriptors such as the perceived utility, competition and the opportunity cost for the chose product. Such questions were phrased indirectly to tackle any barriers from the user into responding. The proposed methodology offers a conversion method analyzing the response from a qualitative to a quantitative measure.

The post-purchase questionnaire, comprises of questions that offer quantitative information for the assignment of a consumer to the proposed segments from Diffusion of Innovation Theory. The post-purchase questionnaire is structured in a way that the total score is analyzed in different thresholds. The higher the total score the higher the chance of a user to be an early adopter.

Further to the above, the structure of the questionnaire utilized allows insight on the consumers Perceived Utility and Perceived Ease of Use. Provided that a consumer is successfully clustered within the Early Adopters segment, those qualitative data can be directly related to the Utility and Ease of Use parameters at the stage of product development. An alignment of Utility and Ease of at the stage of product development with the ones perceived from the consumer would further validate that the advantages and novelty of the product was well received from the consumer.

Moreover, the willingness and understanding of the consumer related to potential price differences to the competition are also tested. The consumer is challenged to justify the selection and demonstrate the ability to sufficiently back their decision. Thus, the results potentially allow a comparative analysis of the pricing strategy and willingness to accept it by the consumer base and specifically from Early Adopters that ensure the critical mass prior to mass acceptance of a product.

Finally, the potential aligned Perceived Utility and Perceived Ease of Use by the consumer to the planned Utility and Ease of Use at development stage of the product in conjunction with the willingness to accept the product over the competition with a clear understanding of opportunity cost, signifies both a rational consumer behavior within the product launch parameters and a validation of the product launch strategy.

Of course, the methodology proposed could be further streamlined and adjusted to a product specific requirement though the nature of outputs provide a combination of insights to the consumer decision pattern that can also denote specific gaps in the decision-making process of other clusters beyond Early Adopters.

Following the proposed structure and the pilot testing of the questionnaire, it has been deemed crucial for future studies attempting to identify similar elements to include identifiers that try to respond to the following matters:

- Ability of the user to identify competition / competitive products
- Ability of the user to justify cost differences compared to competition
- Ability of the user to quantify the level of expected satisfaction from use of the product
- Ability of the user to quantify the level of expected utility of the product

The above set of information has been deemed necessary to assess the consumers' decision-making parameters. Following the theoretical frameworks, an early adopter should demonstrate adequately the ability to clearly respond in such questions. Those are the crucial elements that would have been responded by a rational consumer in a rational and justified purchase of a product or service.

Moreover, on the clustering of consumers, future studies should include the key elements of classification based on the Diffusion of Innovation Theory, to allow segmentation. This thesis has set a minimum of 7 factors to be tested and those factors are

- The extend of an individual's social circle as an absolute number
- The annual income of the individual
- The amount of financial expense in new products / new technologies
- The frequency where the individual is used as a first point of contact by their social circle seeking information on new products / new technologies
- The level of education of the individual
- The level of confidence in describing and communicating the innovation of the new product / new technology
- The amount of effort and frequency of remaining updated in researching the new product / new technology

The higher the level of confidence or absolute number on the above indicators the higher the likelihood of an individual being an early adopter.

The pilot testing of the questionnaire was successful in terms of identifying potential early adopters in a percentage within the Diffusion of Innovation theory segmentation.

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Annex A – Pre purchase Questionnaire in full

1.1 Do you plan to proceed with a purchase today?
Response here

1.2 What is the product you are willing to purchase today?
Response here

1.3 Do you know of any alternatives / competitors to the product you wish to purchase today? If so can you name the alternatives?
Response here

1.4 Out of the competition named above, could you express your order of preference to those products?
Response here

1.5 Can you describe the level of research you have done related to this product?
Response here

1.6 Can you name the competitive advantage of the product that made you decide on the purchase of this product instead of the competition?
Response here

1.7 Do you expect any financial setbacks from your purchase? Are there other priorities postponed proceeding with the purchase?	
YES	NO

1.8 What are your expectations from the product related to the use you intend?
Response here

1.9 Can you describe the level of satisfaction you expect the purchase to bring related to the use you intend?
Response here

1.10 Do you believe that the difference in price justifies the additional functionality or extended use of the product?	
YES	NO

1.11 Is there a real application scenario in your daily life that justifies the additional cost?
Response here

1.12 Is there a real application scenario in your daily life that justifies the additional cost?
Response here

1.13 Can you describe how useful you believe the product to be and how this applies?
Response here

1.14 Can you describe how easy to use you believe the product to be and how that helps in your intended use scenario?
Response here

1.15 What is your age, and do you believe that the product is age specific or not?
Response here

Annex B – Post purchase Questionnaire in full

2.1. What is your educational background?				
Basic Education	Technical Education	Batchelor's Degree	Master's Degree	Doctorate

2.2. How often do you update your knowledge related to technology products and new technologies?				
Daily	Twice a week	Weekly	Monthly	Not on a schedule

2.3. What is your primary source of information related to technology products and new technologies?					
Forums	Social media	Technology Magazines	Technology websites	Technology communities	Other Individuals

2.4. Related to information about a new technology product or new technology from the above sources, do you spend extra time researching?				
I do not spend more time researching	I spend few minutes on other sources	I reference with other sources and spend a few hours	I spend enough time to briefly understand the product or technology	I spend enough time to fully understand the product or technology

2.5. What do you consider as a new technology innovative product?			
A novelty product that was not available in this form	A product that has been updated with some new features	A product that is newer than the one I have	All of them

2.6. How large is your social circle? (Exclude family members and indicate the number of individuals that you frequently interact with)			
Less than 10	Between 10 and 50	Between 50 and 150	Larger than 150

2.7. Related to new technology products and new technologies, how often do you discuss those topics with your social circle (Exclude family members and include only individuals that you frequently interact with)			
I have daily conversations about technology products and new technologies	I might have a conversation weekly	I might participate in a conversation once or few times within a month	Not frequent

2.8. Related to the above question do you initiate such conversations, or you participate in these conversations only if they are initiated by another person?		
I am mostly the initiator of those conversations	I do initiate those conversations, but it is frequent I do not initiate	I like to join such conversations, but I almost never initiate

2.9. Could you describe the level of confidence with which you can describe a new technology product or new technology to an individual of your social circle?			
I am confident in deeply describing the technical elements, innovations, application differences as well as the competitive	I am confident in providing a high-level outline of the technical elements, innovations, application differences as well as the competitive	I can only describe what I have read / been informed about the product without a clear understanding of the technical elements, innovations, application	I don't feel confident providing any information about a new technology product or a new technology

advantages over competing products.	advantages over competing products.	differences as well as the competitive advantages over competing products.	

2.10. How often is it that our social circle asks you for information about new technology products or new technologies?		
I am often their first point of contact when they seek information about a new technology product or new technology	It is frequent that following their research they ask my opinion about it	It is not often for my social circle to ask information from me

2.11. What is your yearly individual income?				
Below 15.000 Euros	Between 15.000 Euro and 30.000 Euro	Between 30.000 Euro and 60.000 Euro	Between 60.000 Euro and 120.000 Euro	Above 120.000 Euro

2.12. What is your average expenditure in technology products			
Below 5% of my income	Between 5% and 10% of my income	Between 10 and 15% of my income	Above 15% of my income

2.13.a Did you purchase the product that you had set in mind when coming here?	
YES	NO

2.13.b Why did you change your mind?

2.13.c Did you purchase an alternative and if so which one?

2.14. Following your purchase do you still believe that the difference in price justifies the features of the product?	
YES	NO