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A BEHAVIORAL ECONOMICS PERSPECTIVE OVER LEAN VERSUS 10X IMPROVEMENT IN NEW PRODUCT DEVELOPMENT – BRIEF REVIEW OF EXISTING RESEARCH

Florian TELEABA, Sorin POPESCU

Abstract: *The New product development (NPD) and behavioral economics (BE) have been researched extensively, yet not in a systematic combined way. In addition, lean philosophy in NPD versus the new 10x mindset of Silicon Valley raise a strategic dilemma: aim for incremental continuous improvement or for '10x' breakthrough improvement? This paper proposes few guidelines and a conceptual framework on using BE in NPD, bringing together for the first time these two domains in a synthesized manner. It also formulates for the first time a potential new cognitive bias: the customer 'try-new' bias, augmented by decreasing pace of product innovation or improvement, and influenced by hedonic adaptation and peak-end rule, in the attempt to provide a BE based answer to the above strategic dilemma. Contributions are theoretical; hypotheses listed remain to be tested and adapted.*

1. INTRODUCTION

Product development appears on the tables of many executives, across industries, and remains a well-researched subject in the academic literature. Products are becoming increasing complex, even connected, given smart and digital capabilities brought by technology. In addition, consumers' needs, wants and preferences are changing today at a much faster rate, are increasingly individual rather than segment or mass similar, and are more difficult to meet. Additional complexity is generated by the need of companies to innovate their products and services at a much higher rate to maintain competitive advantage, by the speed of product adoption by a critical mass of customers and also the speed of dropping those products (due to multitude of choices for consumers in the market space and easiness to switch), and last by the continuous internal organizational pressures to launch new products to market at lower cost.

To add to the complexity, recent advancements and popularity of behavioral economics have showed us that people do not make (economic) decisions in a completely (economically) rational way, and decisions are not always optimal. Heuristics, errors, biases, irrational or ecologically rational, triggered by or next to context, emotions and social influences, all affect our behavior and the decisions we make. As such, how a new product is perceived, adopted (purchased) and used are affected by such behavioral and cognitive aspects.

The product development area is still open for improvement, from the length of time to develop a new product, the satisfaction of customer requirements to the way how new products can be produced . It is open also from the point of view of leveraging behavioral economics understanding in improving both the effectiveness of new product development process in the company, as well as the product adoption and usage by end customers.

This paper brings for the first time behavioral economics insights to answer an interesting dilemma: should a business aim at Lean product development, more specifically incremental continuous improvement, or more radical 10x improvement in its new product development strategy? In addition, the paper brings insights into what cognitive biases, heuristics or other aspects may influence the NPD internal process,

and for the first time proposes a conceptual framework to guide NPD practitioners into when, which behavioral economics concepts, could be used to understand better the voice of customer, develop better products, and ensure better customer adoption and usage.

2. NEW PRODUCT DEVELOPMENT

2.1 New product development

New Product Development (NPD) is about the ideation, formulation, and implementation of new and superior solutions in the market. Beyond the obvious need for organizations to innovate in order to compete, embedded in any NPD program are knowledge, technological expertise, and the social networks that convert these capabilities into offerings that create value at every level—for customers, industries, communities, and regions .

One of the first models, still in use today, to facilitate the new product development is the Booz, Allen and Hamilton (BAH) Model published in 1982 . The seven steps of BAH model are: new product strategy, idea generation, screening and evaluation, business analysis, development, testing, and commercialization. This model represents a foundation for many other models researched and developed since then, as those can be traced back to the same generic steps as this one . For example, the Stage-Gate model or product innovation process that has been found by a benchmarking study in 2010 by APQC to be applied by 88% of US businesses, can be also traced back to the same steps as the BAH model. One of the most popular and contemporary processes is the concept adopted by IDEO, a renowned design and consulting firm – human-centered design.

Without a doubt, there are two critical areas in NPD process: understanding the Voice of Customer, and translating that (the customer requirements) into product technical specifications properly to meet customers' needs and wants and generate satisfaction, loyalty, advocacy, and so on.

Voice of Customer can be captured through multiple methods, with surveys and focus groups being useful for validating what an organization already presumes to know about customer needs . One notable method to capture voice of customer is 'Gemba visit': listening to and observing customers while they are using a product or service to determine what they are doing (or failing to do). To be innovative, an organization needs to know "why" customers want certain features, not only which are those features 6. Another concept known as "Jobs to be done" approach (JTBD), aims at a similar thing – understanding why the customers use a product, what is it that they want to accomplish with that product – and identifying jobs that are poorly performed in customers' lives is said to be the key to successful innovation .

Translating customer requirements properly into product technical characteristics (and furthermore into operational requirements) can be done through multiple methods as well, one of the best know being QFD – Quality Function Deployment, deemed by ASQ as the tool of choice when you are working to determine what you need to accomplish to satisfy or even delight your customers .

2.2 Lean product development and Kaizen

In Lean principles originated in the Toyota Production System (TPS) or lean production . Lean Product Development was formally named first in the book "The machine that changed the world" . Two overarching definitions or concepts of LPD can be found: process-oriented logic, and outcome-oriented logic. The process-oriented logic focuses on the impact of lean principles to reduce waste and to improve value adding in the internal product development process. The outcome-oriented logic focused on how LPD can support R&D to improve the quality and functions of the product and contribute to satisfying customer needs . Significant research has been made on principles, methods and tools utilized in LPD, and they appear under various frameworks and models (from the principles, like 13 principles of Toyota Product Development System to LPD processes and flows , to frameworks – even covering product lifecycle – to the interdependencies between the components of LPD and many others). To illustrate a summary, we use figure 1 as an adapted version from 1, and other research.

As we can see, Kaizen as a philosophy is well embedded in LPD as a focus of the LPD process on continuous improvement and on involvement of every employee or function through cross-functional balanced teams and expertise in the process. Hence, this paper opposes 10x breakthrough improvement with the continuous incremental improvement philosophy from Lean Product Development (base philosophy for both Lean and Kaizen).

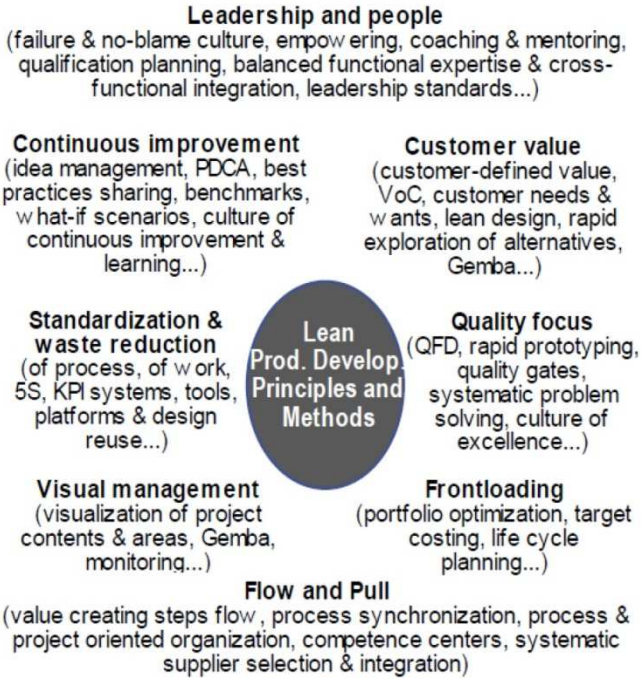

Fig.1. Principles and Methods of Lean Product Development (summary and adaptation from 1, 16 and other research)

3. CONNECTION BETWEEN LEAN PRODUCT DEVELOPMENT, 10X IMPROVEMENT AND BEHAVIORAL ECONOMICS

New product development and particularly lean product development, if done right, promises to dramatically improve a company's competitive position and results, achieving both faster time to market and better cost efficiency, whilst delivering better value to customers. Research exists however that displays the numerous obstacles a company must overcome to successfully implement lean product development, for example difficulty to achieve a cross-functional focus throughout the organization, not only in a dedicated team, inconsistent or low performance if a sequential view of the development process persists, or the effects of managerial focus and involvement .

This paper raises additionally few trade-offs and key strategic questions companies face in new product development today, that have not been researched extensively or answered and persist today in business environment when new product development is in sight.

First, this paper gives a flavour of 'why' these questions appear, or what triggers them, then looks at a short review of behavioral economics, and then comes back to these questions with proposed answers in the form guidelines and hypotheses leveraging behavioral economics.

PDMA Handbook of New Product Development splits products into three main categories: incremental products (considered to be cost reductions, improvements to existing product lines, additions to existing platforms and repositioning of existing products introduced in markets), breakthrough products (new to the company or new to the world and offer a 5–10 times or greater improvement in performance combined with a 30–50% or greater reduction in costs), and platform products (establish a basic architecture for a next generation product or process and are substantially larger in scope and resources than incremental projects) . Breakthrough products is a 'hot' topic today, especially due to the popularization of the term '10x' improvement by Silicon Valley especially in technological products . Yet beyond the philosophy, aiming for 10x improvement in every NPD initiative bears the risk of failure or reaching quite fast a plateau from where you cannot achieve that 10x improvement anymore. In addition, repeated failure from NPD initiatives goes beyond the Lean Product Development philosophy of 'failure and no-blame culture' and can rapidly lead to managerial loss of patience, or people demotivation (for not reaching ambitions repeatedly). As such, the first strategic question on the table of business executives arises:

1. Should we aim for Kaizen continuous incremental improvement, little by little, or for breakthrough '10x improvement' (the Silicon

Valley new philosophy) in a new product development project or process?

NPD is done in the end by humans (at least for now, and to a big extent). Yet humans are prone to many cognitive biases. Long before the popularity of behavioral economics took off, a paper described for instance the impact of such cognitive biases on delays in product development activities . This paper argues such cognitive and behavioral aspects may influence not only the delay, but also the quality and results of the NPD. Therefore, second strategic question arises:

2. As product development is done by humans in the end, how to avoid cognitive biases in how we work to build a new product?

Lastly, consumers are human. As such, they are prone to biases, heuristics, irrational thinking many times in their product purchase and use decision, which is why the third strategic question is:

3. Given that customers do not always make rational economic decisions, as behavioral economics is showing, which of customers' behavioral and cognitive aspects should we take into account, an how, in the new product development?

4. BEHAVIORAL ECONOMICS – A SHORT REVIEW

In the neoclassical economics, the Economic Man, or Homo Economicus, is characterized by several assumptions in terms of rationality (logic and coherence) in what drives the economic decision he makes. However, these assumptions have been under the critique of many behavioral economists, in the try to explain better, why certain decisions of private individuals are made or deviate from what the conventional economists would expect (and thus appear as "irrational" decisions). See table 1 on next page for the differences between conventional economics and behavioral economics.

Behavioral economics was born or better say crystalized in the mid 1900's, along with the work of Herbert Simon in the 1950's (later a Nobel Prize laureate) on the importance of psychological underpinnings in economics, later reflected in the concept of "bounded rationality". According to Herbert Simon, people tend to make decisions by "satisficing", a combination of satisfying and sufficing/sufficient, rather than optimizing or maximizing utility . He argues that rationality is bounded by limits to our thinking capacity, available information and time , backed up also by another Nobel Prize laureate and many others.

Tversky and Kahneman's work on "heuristics and biases" made important contributions to the field later, their thinking already becoming mainstream and enjoying citations or referrals by academics, public and private professionals . Heuristics are cognitive shortcuts or rules of thumb that help people make decisions by substituting a difficult question with an easier one, thus simplifying the decision 23. Heuristics are responsible for biases (systematic errors) when we make decisions.

Notably, Tversky and Kahneman's work also gave to the world the prospect theory . This theory shows how people decide between alternatives that involve risk and uncertainty. It demonstrates that people think in terms of expected utility relative to a reference point, rather than absolute outcomes. By this, decisions are not always optimal and our willingness to take risks in decision-making is influenced by how the choices are framed, or better say how risky choices are framed. The result, or demonstration, is that people are loss averse, and dislike losses more than an equivalent gain. As such, they are more willing to take risks to avoid a loss. In the same time, changes in probability of gaining or losing something do not affect people's subjective evaluations in linear terms . Increasing chances to win a prize from 50% to 60% has a smaller emotional impact than a move from 95% to 100%, even if increase in chances is higher in absolute terms (10 percentage points) and relative terms (20% increase in chance, vs. only ~5%). On the other side, increasing from 0% chance of winning to 5% chance is more attractive than a change from 5% to 10%. People over-weight small probabilities; on the other hand, they under-weight high probabilities.

Richard Thaler, another (recent) Nobel Prize laureate, argued that people think of value in relative rather than absolute terms. As such, he introduced the term "mental accounting" , the

idea that people treat money differently, depending on money origin, or intended use. In addition, he looked at how people derive pleasure not only from the product quality or value, but also from the quality of the process or deal of getting that – transaction utility, and how people derive or feel/perceive a loss if they give up to something for which they already incurred a cost, failing to consider the opportunity costs – sunk-cost fallacy . Some of Thaler's renowned work is reflected in book Budge (2008) written together with Sunstein, where he treated the term "nudging".

Dan Ariely is also one of the most appreciated behavioral economists which continued work on understanding influence cognitive biases. He introduces the term of "irrational" behavior , arguing that sometimes decisions are simply irrational (not in line with the logical and coherent way of thinking), and an important part of his research on this type of behavior concerns prices and value perception. He does not attribute decision making to a shortcut or rule of thumb, nor to another means of simplifying or making faster the decision, but simply to the inability to apply the rational (logical, coherent) means to decide and fall prey to such cognitive biases.

Some cognitive biases are the result of errors in information processing and do not reflect people's motivations. But there are cognitive biases that do or may reflect human motivation (ex. optimism bias, confirmation bias) .

Later on, the study of heuristics advanced from looking at general concepts (ex. availability, representativeness, or recognition heuristics) to understanding more consumer-economic-specific ones like brand name, price and scarcity heuristics .

As a differentiated 'paradigm' or way of thinking in behavioral economics, departing from the ideas of Herbert Simon, Gerd Gigerenzer introduced the "fast and frugal" view, and heuristics, explaining that people are "ecologically rational" and they make best possible use of the limited information and computation / thinking abilities, and apply simple and intelligent algorithms that lead to near-optimal decision . One of the core heuristics in Gigerenzer's work is recognition heuristic, an easily accessible shortcut that simplifies decision-making and indicates that sometimes less is more – less know-how or knowledge can lead to more accurate decision. These fast and frugal heuristics are effective under conditions of bounded rationality, making best use of the limited information available to individuals, limited computation power or limited time available to decide .

The application of behavioral economics in marketing, pricing & promotions, or in (UX: user experience) design has been researched before, case by case. One example is applying behavioral science to app design . Yet there are tens if not hundreds of concepts (biases, heuristics, etc.) that behavioral economics operates with, becoming difficult for the NPD practitioners to understand where to begin, what to account for, in a systematic manner, when building a product with the customer in mind. Yet alone to be able to be conscious on the 'unconscious' – that is, of the cognitive biases affecting NPD activity itself.

5 GUIDELINES AND HYPOTHESES USING BEHAVIORAL ECONOMICS IN NPD

5.1 Continuous incremental improvement versus breakthrough '10x' improvement

Taking Many frameworks exist, more methodological or not, to define a new product development or innovation strategy that balances efforts between incremental improvements and more radical or disruptive innovations, as an example the thinking behind The Innovation Landscape Map . Yet beyond the business aspects, there are also behavioral or cognitive aspects to consider when you are planning to either improve '10x', or have a continuous little by little improvement strategy over time.

For formulating below hypothesis, it is important to distinguish first between adequate and desired quality: the adequate quality is the minimum level of quality that customer finds acceptable, while the desired quality is the level the customer hopes to receive (from either a new

product, or service, or from customer service activities).

Table 1:

Differences between conventional/neoclassical economics and behavioral economics (selection, adapted from [i] and [ii])

	Conventional/neoclassical economics	Behavioral economics
.ationality	People are fundamentally rational and will make choices and behave so to achieve their goals. They will not make systematic errors	People are not rational all the time and make errors that reduce their chances of achieving their goals Some errors are regularly repeated (systematic)
tility aximization	People are all maximizers (the mantra of economics). People choose what maximizes their utility	People don't have the capacity to maximize, so they do their best given constraints they face – satisficing behavior
.nowledge	People have perfect knowledge: of all alternative opportunities relevant to the decisions to make, how those decisions will affect the future, how they will think and feel in the future, what the future probabilities and possibilities are	People don't have the time and resources to obtain all information relevant to the decision, so they make satisficing decisions. They don't have the ability to forecast into the future, leading to uncertainty and risks. They place insufficient/biased weights on future events and outcomes
laking ıental alculations	People have unbounded computational capabilities, making rapid and accurate calculations – the decision will be best meeting the needs	In the real world people lack the brain capacity to process rapidly vast amounts of information and make accurate calculations mentally (or even with help of computers)
references · stability	People preferences are completely stable and not affected by context: if you prefer an orange to an apple, you will not suddenly change and prefer an apple to an orange	People preferences are not stable, and change subject to context, emotions and other factors. And people's preferences change over time
references onsistency	People preferences are completely consistent: if you prefer an orange to an apple, and an apple to a pear, then you will prefer an orange to a pear	People preferences are not consistent, and change subject to context, emotions and other factors
Villpower	People have no trouble to resist impulses and temptation	People lack sufficient willpower and give way to temptations and impulses when making decisions
olitary ecision ıaking	People are not influenced by others when making decisions	People's decisions are influenced by social norms social pressure, peer pressure, relatives and friends People make decisions in a social, historical and institutional context

Prospect theory of Kahneman and Tversky indicates an S-shaped value function, arguing that people assess utility or quality, and make decisions, depending on (a) loss aversion (the function is steeper in the negative than in the positive domain) and (b) reference dependence (gains and losses are evaluated in terms of a reference point). Similarly, Thaler showed that the value of a product is perceived higher when the product is viewed as something that could be lost, than when it is viewed as something that could be gained . Departing from these concepts, this paper formulates the following hypothesis.

Hypothesis:

A firm that develops new products or services, of at least adequate quality, at a certain rate, will experience the following effects:

(a) If a new product (10x or incrementally improved) is introduced in a certain amount of time, even if the product is below desired level of quality, but above adequate quality still (sufficiently good in other words), the customers will perceive as sufficient improvement. In this case, churn will likely not increase (depends also on product's competitive position evolution and easiness to churn).

(b) If a new product (10x or incrementally improved) is not introduced in a certain amount of time, even if the product is of adequate or even desired quality, the customers will believe it is of less than previous perceived quality. This will trigger dissatisfaction and may trigger churn increase. The higher the frequency is with which a new product (10x or incrementally improved) has been introduced in the past, the higher this effect will be.

(c) The higher the frequency of introducing a new product (10x or incrementally improved), the higher the satisfaction and loyalty of customers will be.

Authors call this effect the 'try-new' bias, and argue that this (and customer churn basically) is augmented by decreasing pace of product innovation or improvement.

In other simpler words, and understanding the implications of this: if you have a good enough product, and do not innovate or improve so frequently, the customers may be 'satisficed', and churn is kept at a reasonably stable level. The more you get your customers used to getting at a certain rate new products or product improvement (incremental or 10x), the more you must keep up the pace, otherwise your churn will increase, even if your product quality is good and even equal to desired quality. And the more aggressive your improvement or innovation is (going from incremental up to 10x), the more you should keep up that pace. It all comes down to the fact that people think in terms of expected utility relative to a reference point, rather than absolute outcomes, and how that reference point is formed; to how (re)gains and losses are perceived versus that reference point; and to how people's subjective evaluations evolve in non-linear terms (improving a little from nothing will seem high improvement, but improving with the same amount from a high level already existing will seem insufficient).

The third point (c) of this hypothesis can be explained through 'hedonic adaptation'. Hedonic adaptation occurs when you get used to changes in life experience, returning to a relatively stable base of happiness. According to research, repetition of smaller positive hedonic boosts, or positive experiences, has a more lasting effect on our wellbeing than major life events. In a similar way, one can hypothesis that this applies in new product launches as well: getting used to incremental and frequent product/service improvements may contribute more to long term customer loyalty and retention than '10x' improvements at a lower frequency (from time to time).

Two notes are important to add to this hypothesis:

- Peak end rule: Kahneman & Tversky explained that according to this rule, people tend to remember an event based on the most extreme point and the end of the episode, not based on the average level of positive or negative feelings experienced throughout the event. As such, the duration of the event plays less importance in memory versus those peak moments. Departing from this, the paper argues that once customers are lost, for those lost customers the 'memory' of how they interacted with your product will be higher influenced by few of those '10x' improvements in quality of product or service, and not by how hedonically they adapted to continuous incremental improvements while they were purchasing or using your new products.
- In research several regularities have been discovered regarding consumer brand choice. Ehrenberg et al. analysed enormous data and found systematic results : most consumers practice multi-brand purchasing, choosing apparently at random from a repertoire of three-four brands perceived as substitutable in a product category. Furthermore, during a period of one year, to meet their requirements in a product category, consumers of a given brand A tend to buy other brands more often than they would buy brand A, and only a small proportion of ca. 10% consumers tend to be exclusive buyers or 100% loyal. Sole buyers are found to be relatively light users of their favorite brand, contrary to traditional marketing belief that loyalty is equivalent of being a heavy user and thus of higher value to the business. With this in mind, this paper argues that a company will likely not reduce base churn rate even if it introduces sometimes new products or services (10x or incremental), unless that frequency of introduction is stable.

The bottom line lesson for businesses regarding NPD: choose a rhythm of introducing new products and services (10x or incremental) and sustain it! When customers do want to churn, 'wow' them just before or when they do that – a 10x improvement in how you serve them before they leave – they will likely remember you as good, and return or say good things about you to others. In case of products with a short life cycle and rapid rotation or purchase

frequency, pikes of 10x incremental improvement are likely to be more required within the set sustained rhythm of new product development/improvement.

5.2 Avoiding biases in NPD activity itself Guidelines:

NPD teams and managers should be careful to which biases they themselves may have in their activities, especially in understanding voice of customer and testing. Some examples steaming from some of the most known concepts of behavioral economics (non-exhaustive) are listed below. This is an indicative summary based on interpretation of desktop research (various business articles) and discussions with various product managers in different industries along the time in my professional experience). As such, a proper next step would be to perform a quantitative research to test their frequency, when they appear, their impact (beyond 'delays' which has been researched in academics before [20]).

- Anchoring bias. For example, if you test a new idea with customers and it brings good results, you may be less likely to try other tests, or may judge next results' size based on first ones, having biased expectations.
- Herd behavior, or bandwagon effect. For example, you may be biased to interpret or believe something about customers' needs and wants, or about how a product should be built, just because other people do/did so.
- Salience, and subsequently availability and affect biases. For example, is the information that seems relevant and used as reason, only standing out or new, or is it relevant indeed?
- Confirmation bias, and subsequently backfire effect. For example, are you interpreting information objectively and sufficiently, or just in the way that confirms your initial hypothesis? And if evidence arises that disconfirms your initial hypotheses, are you dropping those initial beliefs, or just find other reasons to argue your case?
- Framing effect. For example, in the way you ask questions for understanding voice of customers, or the way results (ex. of testing) are presented within the team. Framing especially in terms of positive vs. negative way of displaying information or choices.
- Loss aversion. For example, the 'pain' or perception of losing an existing product or feature (few buttons on a remote control) may seem higher than the gain from making that change (overall usability), even if it is not. In turn, this is connected to and may lead to a status quo bias, and to too complex products or processes by only adding and not 'losing' what is unnecessary.
- Information avoidance and the opposite. The opposite refers to the tendency to look for too much information even if it is irrelevant.
- IIKEA and endowment effects, and subsequently sunk-cost fallacy. For example, because time, material were invested in the NPD, are you protecting too much the progress/result when you should not, when evidence suggest results are not as expected? And if so, are you continuing with finalizing the NPD project or keeping the product in the market just because so much was already invested, even if rationally/economically it would make sense to stop it?
- Choice overload, leading to choosing by not choosing. For example, given so many options available to innovate,are you biased toward leaning to the default option of doing rather nothing, or rather waiting more time for better decision to occur?

5.3 Accounting for customers' cognitive and behavioral aspects

NPD teams and managers should try to ask themselves which biases, heuristics or other cognitive or behavioral aspects influence how their customers perceive the new product or service, their purchase decision, and further their decision to use the product or service.

In the table 2 above, this paper proposes a conceptual framework to be used as a checklist at different points in the NPD process. This conceptual framework synthesizes the main concepts behavioral economics deal with in six main dimensions, characterized by similar attributes.

Table 2:

Dimensions and concepts of BE and their potential consideration in NPD process

Dimension	Main concepts	VOC understanding	Product building	Product testing	Product launch
Utility	Types of utility : experience, procedural, transaction, discounted, remembered, instant vs. forecasted, social. Satisficing. Mental accounting. Partinioning. Endowment effect. IKEA effect. Hedonic adaptation. Sunk-cost fallacy. Scarcity. Idiosyncratic fit. Motivating uncertainty effect. Goal gradient theory. Zero-price effect.	*Important during Gemba. Likely difficult to interpret from quantitative research*	Highly recommended, think how customers will derive and perceive utility	*Likely useful in physical testing, less in quantitative research (call, interview)*	Highly recommended, communication to customers' perception of utility
Uncertainty and risk	Loss aversion and reference dependence. Availability heuristic. Representativeness heuristic. Recognition heuristic. Confirmation bias. Overconfidence and control premium. Risk-as-feelings model. Information avoidance.	Highly recommended, understand key buying/switch factors	*Important to building easy to adopt/use/switch products*	*Important to how testing occurs, to avoid biased results*	Highly recommended, to maximize adoption and usage
Probabilities and weights	Certainty and possibility effects (decision weights). Naive allocation / 1-N heuristic. Optimism bias. Ratio bias. Gambler's fallacy. Category size bias. Hindsight bias.	*Important to how VOC questions are constructed*	*Important to thinking who will be first adopters and when*	*Important to how testing occurs, to avoid biased results*	*Recommended in articulating communication and display*
Temporal	Time and hyperbolic discounting. Present bias. Diversification bias. Planning fallacy. Peak-end rule / evaluation by moments. Empathy gap. Dual-self model.	*Important to understand at which moments VOC, needs and wants occur*	Highly recommended planning of lifecycle management	*Important to understand when and what (parts) to test*	Highly recommended communication of benefits
Social	Social norms. Social proof. Herd behavior. Cognitive dissonance. Commitment. Reciprocity.	*Recommended as control variables*	*Important to thinking who will be first adopters and why*	*Recommended as control variables*	Highly recommended, maximize adoption
Choice	Affect heuristic. Salience. Anchoring bias. Nudging. Choice architecture (incl. Framing effect, default options, extremeness aversion, asymmetrically dominated choice, decoy effect). Choice overload. Less-is-better effect. Elimination by aspects. Decision staging / choice bracketing. Take the best heuristic. Take the first heuristic. Halo effect.	Highly recommended, understand key buying/switch factors and technical characteristics importance	Highly recommended, thinking of future customer decision journey	Highly recommended, test best adoption rates and technical characteristics importance (QFD)	Highly recommended, maximize adoption (communication, display)

It then maps them on a simplified NPD process composed of four main phases, showing which types of BE concepts may be more useful in which NPD phases. This will help NPD teams and managers understand where different concepts can be utilized in

the NPD process, for better anticipating customer decision making, customers' quality perception/appreciation, and the factors that affect those.

Explaining how to use, or test for their application and impact, requires more research and description than a short article.

6. SUMMARY AND OUTLOOK

This The presented way to look at the strategic dilemma "incremental continuous improvement versus 10x breakthrough improvement" brings in the behavioral and cognitive aspects of customers in their perception of quality, satisfaction and loyalty evolution.

The paper introduces a new cognitive bias concept, the **'try-new' bias**, and argues that this (and customer churn basically) is **augmented by decreasing pace of product innovation or improvement**. In this respect, it brings insights from the prospect theory, more specifically loss aversion and reference dependence concepts, to explain that if a firm introduces a new product (10 x or incrementally improved) at a certain amount of time (even if the product is below desired quality level, but above adequate quality level), the customers will perceive that improvement as sufficient, case in which churn will likely not increase. On the other hand, if that pace decreases, the customers will perceive the existing product as of less than previous perceived quality, and churn may increase, causing the 'try-new' bias. The paper argues that once a certain rhythm of new product development/improvement is set (continuous incremental improvement or 10x), it should be kept, bringing in attention also results from previous brand choice researches, that have shown how even loyal customers typically switch between 3-4 brands of choice from same category – thus, a base churn will likely exist most often.

In addition, hedonic adaptation principle is used to argue that continuous incremental improvement may be preferred as opposed to 10x breakthrough improvement, as a means to reach higher customer satisfaction on long term, next to the obvious notion that 10x breakthrough improvement may be difficult if not impossible to be kept/sustained for a longer period of time. Concluding with these two contrasting arguments one in favour of Lean continuous product improvements, the other more in favour of 10x breakthrough improvements peaks, the paper draws the conclusion in opposing Lean to 10x improvement in new product development: choose a rhythm of introducing new products and services (10x or incremental) and sustain it! When customers do want to leave, 'wow' them just before or when they do that – a 10x improvement in how you serve them before they leave – they will likely remember you as good, and return or say good things about you to others. In case of products with a short life cycle and rapid rotation or purchase frequency, pikes of 10x incremental improvement are likely to be more required within the set sustained rhythm of new product development/improvement.

The paper also reflects on few main behavioral economics aspects that may affect the internal new product development activities, in essence the main cognitive or behavioral biases NPD practitioners should be aware of and try to avoid when they develop new products.

Furthermore, the paper brings together in a synthesized and systematic way, more than 60, most important concepts of behavioral economics, combines them in six main dimensions, and shows when these could be best used in new product development activities having in mind the customer perspective, along four main phases: understanding voice of customer, product building, product testing, product launch.

- During voice of customer understanding, uncertainty and risk, as well as choice dimensions, are considered to be most important to reflect upon from the customer perspective/point of view. Utility dimension may be important mostly during Gemba, whereas temporal or social dimensions important rather as control variables.
- In product building, utility and temporal dimensions of customers are deemed very useful to take into account, as well as choice dimension thinking of the future customer decision journey. Uncertainty and risk may bring insights into how to ensure easy switch and adoption, whereas social dimension to build products with early adopters in mind.

- In product testing, all dimensions will be relevant for specific testing purposes, while choice dimension is considered most important to be understood especially for further quality function deployment and ensuring best product adoption rates.
- In product launch, next to choice dimension again, most other dimensions are considered useful to leverage: utility, uncertainty and risk, temporal, and social dimensions.

The presented conceptual frameworks to (a) biases in internal NPD activities, and (b) how to use BE aspects of customers in NPD process, offer guidelines to NPD practitioners to improve their activities and their products adoption and usage rates.

While testing for these hypotheses remains on the 'to do' list, this paper provides ground for further research at the intersect of BE and NPD domains.

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O PERSPECTIVĂ PENTRU ECONOMIILE COMPORTAMENTALE PRIN LEAN VERSUS 10X ÎMBUNĂTĂȚIRE ÎN NOUA DEZVOLTARE A PRODUSELOR - REVIZUIRE SCURTĂ A CERCETĂRILOR EXISTENTE

Rezumat: Lucrarea Dezvoltarea de noi produse (NPD) și economia comportamentală (BE) au fost cercetate pe larg, dar nu într-un mod sistematic combinat. În plus, filosofia slabă în NPD față de noua mentalitate de 10x din Silicon Valley ridică o dilemă strategică: obiectivul unei îmbunătățiri progresive incrementale sau al îmbunătățirii progresului "10x"? Acest document propune câteva linii directoare și un cadru conceptual privind utilizarea BE în NPD, reunind pentru prima dată aceste două domenii într-o manieră sintetizată. De asemenea, formulază pentru prima dată o potențială nouă părtinire cognitivă: părtinirea "încercării" a clientului, mărită de ritmul de scădere a inovării sau îmbunătățirii produsului și influențată de adaptarea hedonică și de regulile de vârf, în încercarea de a furniza un BE bazat pe dilema strategică de mai sus. Contribuțiile sunt teoretice; ipotezele enumerate trebuie să fie testate și adaptate.

Florian TELEABA, Technical University of Cluj-Napoca – Department of Design Engineering and Robotics
Sorin POPESCU, Professor, PhD, Technical University of Cluj-Napoca – Department of Design Engineering and Robotics, Cluj-Napoca, Romania