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Effective Nudging in Product Design - A Case Study in the Window Construction Industry

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Abstract

The growing complexity of product design poses a challenge for team management. Nudging, a targeted behavioral influence method, offers a potential tool to address this matter. This study explores how nudges can aid product developers in decision-making. A field study in the innovation management department in the home appliances industry identified effective nudges and their degree of contribution. A workshop format introduced managers to nudge design and use. Findings showed positive impacts of nudges, notably improving transparency, collaboration, and team awareness, proving to be a promising tool for managing complex innovation processes in practical application.

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1. Introduction

In modern product development, decisions are of central importance as they can significantly influence the direction and success of a project [1]. As Richard THALER points out, it is a misconception to think that you cannot influence the decisions of others:

"The first misconception is that it is possible to avoid influencing people's choices." [2]

Every decision is characterized by its decision architecture and can be influenced by subtle, conscious or unconscious factors [2]. These influences can have a major impact on costs, time and quality, especially in the 'early stage' of product development, and thus have a decisive influence on the overall success of the project [1]. Against this background, the question arises as to how decision-making processes can be specifically and positively influenced in order to achieve the

desired project goals. A promising approach from behavioral economics is 'nudging', subtle impulses that steer decisions in a desired direction without restricting the freedom of choice of those involved. Especially in product development, nudging offers great potential to support teams in efficient decision-making and to advance complex projects in a targeted manner [3].

To date, however, many studies have focused on theoretical principles, while there is a lack of empirically validated approaches to the practical implementation of nudges in industrial contexts [4]. This field study examines nudges that were developed in a workshop and implemented in product development. The aim is to evaluate the potential of these nudges in real-life use and to find out how nudging can effectively contribute to the achievement of objectives in an industrial environment.

2. State of the Art

2.1. Decision Architectures in the ‘Early Stage’ of Product Development

The success of a project is largely determined by decisions made in the ‘early stage’ of product development [5]. The ‘early stage’ of SGE – System Generation Engineering is the stage in the development process of a new product generation that begins with the start of a project and leads to a tested technical solution [1]. The decision-making processes underlying these decisions play a central role in the ‘early stage’ of product development [6].

In this context, psychologists and neuroscientists have developed a model that describes how the human brain works when making decisions. This approach distinguishes between two modes of thinking: an intuitive-automatic mode and a reflective-rational mode. These thought processes are often referred to as the ‘automatic system’ (system 1: fast thinking) and the ‘reflective system’ (system 2: slow thinking). The ‘automatic system’ can be characterized as fast and instinctive, while the ‘reflective system’ can be described more as deliberate and conscious. [5, 6]

The behavioral economist Richard THALER and the legal scholar Cass SUNSTEIN describe the decision architecture as an environment in which people make decisions. The two authors advocate the use of this environment to influence human decision-makers and change their behavior. The two authors define ‘decision architects’ as people who are responsible for creating a specific environment. The creation of this environment can be intentional or unintentional [2]. In addition to the theory of decision architecture, empirical data provide important insights into the practical distribution of decision-making situations.

LÜDCKE and BIRKHOFER [7] determine the percentage distribution of decision situations in product development on the basis of empirical studies. The empirical studies led to the following results with regard to the classification of decision-making situations: 70% of decision-making situations are directly linked to a project, 27% of decision-making situations are based on organizational challenges and 3% of decision-making situations have a personal reference. The large proportion of project-related decision-making situations indicates that these decisions in particular deserve closer scrutiny. Understanding the decision architectures in project-related contexts could provide valuable insights for the targeted design and optimization of decision-making processes in product development.

2.2. Nudging

THALER [2] refers to the control of decisions through the design of the decision architecture as ‘nudging’. The term ‘nudging’ is derived from the English and roughly means ‘to trigger’. Nudging refers to the targeted but subtle influence of decisions, whereby people are guided towards desirable behavior by certain cues or incentives. HANSEN [8, p. 158] describes a nudge as:

“A nudge is a function of any attempt at influencing people's judgment, choice or behavior in a predictable way that is made possible because of cognitive boundaries, biases, routines and habits in individual and social decision-making posing barriers for people to perform rationally in their own declared self-interests and which works by making use of those boundaries, biases, routines, and habits as integral parts of such attempts.”

Decision architects can use nudging to design the decision architectures. According to THALER [2], this design should be carried out in such a way that no choice option is excluded and the economic incentives are not significantly changed. A nudge, as an intervention, must therefore ensure the complete preservation of an individual's freedom of choice. As soon as a measure no longer allows people to make their own decisions, it can no longer be labeled as a nudge. In addition, nudges must aim to improve the well-being of the individuals concerned by guiding their decisions in a direction that serves their long-term benefit. [2, 9]

In their study, TANAIUTCHAWOOT et al. [10] analyze the use of specific nudging approaches, such as feedback, incentives and the structuring of complex decisions, in product development. The effectiveness of nudging was analyzed based on an evaluation of a creative workshop at a car manufacturer. The study shows that the use of nudges leads to a significant reduction in cognitive bias, which in turn enables more informed decision-making.

In addition, there are numerous factors that influence thinking and decision-making behavior and can also play a role in product development. These include random scattering (noise), priming, heuristics, social and cultural influences, emotions, cognitive bias, intuition and many others. The targeted use of nudges in particular offers great potential for optimizing decision-making processes in product development and thus achieving overarching goals more effectively. [3]

Reference products can also serve as nudges in the context of SGE – System Generation Engineering. They have a significant influence on the success of product development: high-quality reference products promote better product quality, while inferior or missing reference products can negatively impact the quality of new products. By using good reference models, the quality and alignment of new products can be specifically supported. [11,12]

3. Research Gap and Objective

Research on nudging in product development has yielded promising initial approaches, but there is a lack of practice-oriented studies that investigate the direct use and effect of nudges in real-life application scenarios. This field study addresses this gap by specifically analyzing nudges that were developed in a workshop and subsequently implemented in product development in a company. The focus lies on the impact and potential of these nudges, particularly concerning the challenges and framework conditions of an industrial context. The study aims to evaluate the effectiveness and influence of nudges in product development, whereby the following research questions are posed:

- 1) How can nudges be developed based on individual goals and constraints?
- 2) What do targeted nudges look like in the context of the company in the area of product development, and how can these nudges be applied and placed in the given context?
- 3) What added value do the implemented nudges provide in the company?

This field study takes a structured approach to analyzing the effectiveness of nudges in industrial product development. The research questions serve to specifically analyze and evaluate the developed nudges and enable well-founded statements to be made about their practical applicability and actual effect. In an initial workshop, targeted nudges are developed with representatives of all affected stakeholders, which aim to positively influence decision-making processes and are implemented in a real working environment. The evaluation combines quantitative and qualitative methods. To evaluate the effects of nudges, key metrics such as access rates and progress indicators are gathered to ensure objective and reliable results. In addition, an expert interview with the person responsible for the project provides qualitative insights into subjective perceptions and experiences. This methodological approach makes it possible to record both measurable data and individual perspectives and thus gain a comprehensive understanding of the impact and potential of the nudges developed in practice.

4. Procedures and Results

4.1. Nudging development in the workshop

The organization of the nudging workshop is based on a total of six phases, which are derived from the SPALTEN concept [13]. The Welcome and Introductory Phase (phase 1) serves to familiarize the participants and get to know each other. This is followed by the Input Phase (phase 2), in which the basics of nudging are explained with explanations of the relevant terms and examples. The definition and specification of main and secondary goals as well as boundary conditions takes place in the Goal Definition and Boundary Condition Phase (phase 3). In the Transfer and Brainstorming Phase (phase 4) the development of new nudges takes place. In the

subsequent Future Phase (phase 5), the preferred nudges selected by the team are further elaborated. The ideas are prepared for implementation, and feedback is subsequently collected from the workshop participants. Figure 1 provides an overview of the workshop structure.



Figure 1: Overview of the workshop phases

The workshop was held in the company's 'Innovation Lab', a creative space specially designed and equipped for workshops. The group of participants comprised six people who work in the field of product innovation and have a technical focus. It aims to promote product development from the idea to the market launch. A total of six objectives and five boundary conditions were defined during implementation with the company. The six objectives are presented below in the form of a list. The first element of the list presents the primary target that was selected from the group. The selection was made taking into account a pair comparison.

1. **Increasing the willingness to participate**
2. Too many rounds of ideas - shortening the necessary rounds of ideas
3. More discipline among participants
4. Better stamina in the sprint
5. Better team composition
6. Adaptation of the mindset to agile methodology

In addition to the objectives, the boundary conditions were also defined with the participants. These are as follows:

- Error culture is hardly present
- Awareness and understanding of agile methodology not high
- Participants are provided by the manager
- Different roles of the participants
- Only internal employees take part in sprints

On this basis, a total of 65 ideas were developed in the form of possible nudges. Through an internal vote conducted by the participants, 6 ideas (Nudge N1 to N6) with the greatest potential from their point of view were selected and further developed with the help of a framework. This process resembles a funnel as shown in Figure 2. The six ideas can be categorized as *advertising and interior design, motivation and progress, and future and ideas*.

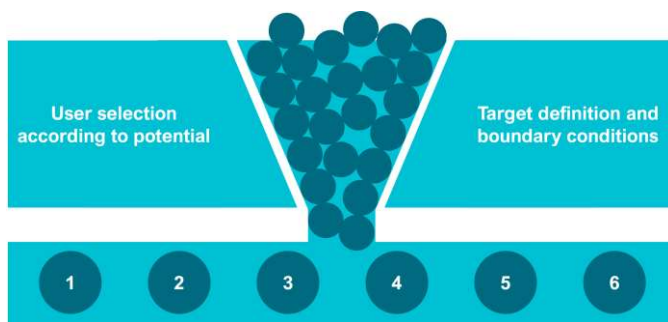


Figure 2: Idea funnel for nudging ideas

In the *Motivation and Progress* category, the nudge ‘**Motivation Reminder**’ (Nudge N1) is intended to remind participants of the event through messages and posts before the sprint and to increase their anticipation and motivation. The ‘**Progress Indicator**’ (Nudge N2) is intended to show the current status of the sprint in the form of a glowing traffic light and thus support goal orientation.

The *Advertising and Interior Design* category includes the nudges ‘**External Advertising**’ (nudge N3) and ‘**Room Design**’ (nudge N4). The ‘External advertising’ nudge is intended to draw attention to the implementation of the sprint by means of design references and intranet contributions and thus increase awareness of sprints, projects and the team as well as interest and willingness to participate. The ‘room design’ should make the sprint room more inviting in order to create a creative and inspiring atmosphere.

In the *Future and Ideas* category, the nudge ‘**Immerse Yourself in the Future**’ (Nudge N5) is designed to help participants better visualize future scenarios for the company. This nudge is to be realized with the help of VR glasses. The ‘**Idea Generator**’ (Nudge N6) is intended to provide creative impetus through thematically appropriate balloons and guide the brainstorming process in the desired direction.

4.2. Implementation of the Nudges in Practice

All the nudges developed in the workshop were taken into account as part of the practical application. The nudges developed in the workshop were implemented in several company sprints to evaluate their impact and effectiveness in various contexts and objectives. The target definitions of the individual sprints were different so that the nudges were used in varying framework conditions and with different groups of participants. This made it possible to observe the effects of the nudges in heterogeneous working environments and to evaluate their flexibility and adaptability. The sprints were conducted with teams from different professional fields and specialisms, including technical professions, creative roles and project management positions. This diversity helped to test the effectiveness of the nudges in a realistic business environment, as participants brought different character traits, perspectives and ways of working. This allowed conclusions to be drawn about how specific nudges work depending on professional background and team dynamics.

The implementation of the nudges is described in detail below. The ‘**Motivation Reminder**’ (Nudge N1) was used before each sprint to get participants in the mood for the upcoming tasks. Personalized messages with motivational content were created and sent to the participants shortly before the start of the sprint. The messages also contained AI-generated images depicting inspiring scenes. In some cases, the reminders were sent via posts in the company’s internal messaging system, with participants specifically tagged to ensure a direct approach. The nudge ‘**Immerse Yourself in the Future**’ (Nudge N5) was implemented using VR glasses. Before the sprint began, participants were shown a futuristic video via the goggles that visualized possible future scenarios in the company context. This immersive component was intended to prepare a certain mindset and perspective for the upcoming sprint.

For the ‘**External Advertising**’ (Nudge N3), large balloons were attached to the windows of the venue, which were visible from both inside and outside. The balloons were arranged to form the word ‘Sprint’ and signaled that a specific project activity was taking place within the company. This visual design made the project prominently visible and provided a clear indication of ongoing sprint activities. The ‘**Progress Indicator**’ (Nudge N2) was realized on a flipchart using LED lights. The most important milestones of the sprint were visualized on the flipchart, and each time a goal was reached, the corresponding LED was activated. This display was placed in the center of the room and allowed participants to track the progress of the sprint at any time. The event room was perceived as cold and sterile before the implementation of the ‘**Room Design**’ (Nudge N4). The use of plants and additional seating options with cushions made the room warmer and friendlier, and there were also more opportunities to sit in small groups beyond the central meeting table. The ‘**Idea generator**’ (Nudge N6) is used in the form of balloons. For this purpose, shapes were selected that fit the respective goal. Balloons shaped like tools were used as nudges to focus ideas on the importance of production.

4.3. Results of the Implementation

Quantitative and qualitative data sources were combined to analyze the nudges used. The objective, quantitative data includes numerical values from the intranet as well as results from other standardized evaluations. In addition, subjective, qualitative information provides an insight into the personal experiences and perceptions of those involved. This perspective is deepened by an interview with the person responsible for the project, which enables a more comprehensive contextualization and assessment of the individual feedback. This creates a holistic picture of the impact of the measures.

In the area of ‘**External Advertising**’ (Nudge N3), the number of views of the intranet post shows a noticeable increase in interest. While the six immediately preceding intranet posts achieved views in the range of 126 to 309, the intranet post promoting the sprint achieved 510 views. In comparison to the three posts directly following it, whose views were between 138 and 365, it is clear that the intranet

post about the sprint generated above-average attention. This data suggests that the measure of ‘external advertising’ may have increased the interest and visibility of the project within the company. In addition, the nudge led to greater attention from management, which could be observed through the direct approach to the project team by the CFO and CEO.

The nudge ‘**Idea Generator**’ (Nudge N6) implemented as balloons in the tool design served as a visual element to support the brainstorming process. Without the use of this nudge, a total of 8 ideas were developed. With the use of the balloons, the number of ideas generated rose to 34, 18 of which were directly related to production. Previously, the number of ideas with a direct link to production was always lower. These figures provide an initial insight into the potential effect of the visual stimulus on the generation of ideas and the thematic focus of the results. This shows that nudging can be used to better manage results from the sprint in order to achieve overarching goals.

The expert interview with the person responsible for the project revealed that the nudges used significantly improved the participants' orientation and increased their motivation. In particular, the ‘**Motivation Reminder**’ (nudge N1) and the ‘**Progress Indicator**’ (nudge N2) provided by the status lights had a motivating effect. The participants were pleased to be able to activate the status lights by achieving individual milestones, which gave them better orientation in the sprint process and visible feedback on their progress, thus boosting their motivation.

The redesigned ‘**Room Design**’ (Nudge N4) functioned as a targeted nudge to boost motivation by enhancing the sprint experience through a more appealing and enjoyable atmosphere. Studies show that a positive working environment that promotes enjoyment and motivation can also strengthen employees' ability to innovate. Systematic studies show that agile working methods and a motivating room design support the innovative strength of organizations. [14, 15]

The nudge ‘**Immerse Yourself in the Future**’ (Nudge N5) supported the participants' willingness to innovate: They developed new ideas more quickly and were better able to engage with future-oriented concepts thanks to the immersive presentation.

According to the person responsible for the project, the nudge ‘**External Advertising**’ (nudge N3) in the form of balloons also led to an increased willingness to participate. Whereas it was previously challenging to recruit enough participants, this nudge generated such high demand that a waiting list was created. In addition, the presence of the balloons led to an increase in inquiries within the company as to whether a sprint was currently running and what content was being covered. This targeted visualization of the sprint aroused curiosity and increased awareness of the project.

5. Discussion and Conclusion

The results of the field study in the industrial context show that the targeted nudges, which were specially developed and elaborated in the workshop, have a positive influence on the motivation and orientation of the participants in the sprint

setting. These customized nudges - including ‘**Motivational Reminders**’, ‘**Progress Indicators**’, ‘**Room Design**’, ‘**External Advertising**’, ‘**Immerse Yourself in the Future**’ and ‘**Idea Generators**’ - fulfilled specifically defined functions to support the sprint goals and thus contributed to increased productivity and motivation. In particular, the nudge ‘**External Advertising**’ (nudge N3), which generated attention through visible balloons, led to an increased willingness to participate and great interest in the sprint content. The resulting waiting list and the increased number of inquiries about current sprint content illustrate that targeted communication measures can arouse interest and curiosity within the company. The nudges ‘**Motivation Reminder**’ (Nudge N1) and ‘**Progress Indicator**’ (Nudge N2) gave the participants orientation through constant feedback and supported the awareness of goals, while the ‘**Room Design**’ (Nudge N4) and the immersive component ‘**Immerse Yourself in the Future**’ (Nudge N5) created a creative and productive atmosphere that additionally stimulated the generation of ideas. The nudge ‘**Idea Generator**’ (Nudge N6) in the form of thematically designed balloons played a central role in supporting the generation of ideas. The specifically selected balloon shapes, such as tools for production-related topics, were used to deliberately steer idea generation in a certain direction. This visual stimulus enabled the participants to focus their creativity on relevant topics and thus contributed to a higher quality and focus of the ideas developed.

In summary, it can be said that the nudges developed in the workshop successfully promoted specific behaviors without restricting the participants' freedom of choice. These targeted measures have the potential to serve as effective tools for improving team dynamics and engagement in complex innovation processes. For future research, it would be useful to investigate the long-term effect of these specific nudges in order to better understand how such measures work in different industrial contexts and how they can contribute to a sustainable optimization of decision-making processes. Due to the limitation of this case study to a single company, it is recommended to conduct further laboratory studies and initiate transfer studies in other industries and companies. The focus here is on further verification of the methodology in order to become a useful decision-making tool in the future.

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