Making Motivation Theories Accessible: Introducing Motivation Cards to Map Motivators for Security and Privacy Education

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Abstract

When an individual is motivated, they are more likely to initiate, pursue, and persist in activities. Motivation theories from educational psychology can further our comprehension of factors influencing learners' engagement in Security and Privacy Education (S&PE). However, the abstract nature of psychological concepts and the proliferation of theories can make it challenging for practitioners to examine and intervene motivation in S&PE. We drew upon the insights of a recently synthesized framework of motivation theories and designed *Motivation Cards*, which can be used to map an individual's motivational factors, providing a flexible and accessible approach for researchers and educators. We discuss study opportunities for utilizing the cards in developing engaging solutions and behavior interventions in S&PE.

1 Introduction

Understanding individuals' motivation benefits the design of user-oriented interventions, such as more engaging forms of security training [7,16]. Motivation can be a pivotal process or mechanism for enhancing learning outcomes [22]. Motivation theories provide a unique lens in explaining and intervening an individual's engagement with activities [22,30]. A range of theories have been proposed to explain motivation in educational contexts; however researchers have found that different terms from distinctive theories have been created to refer to similar concepts [29]. To pursue clarity of terminology and enable evaluations of competing theories, Hattie et al. proposed a synthesized motivation framework consisting of five popular theories [15], i.e., Self-Determination Theory, Social Cognitive Theory, Achievement Goal theory, Expectancy-Value Theory, and Attribution Theory. They categorized 30 motivational factors into **seven aspects**: *self, social, cognitive, goals, task attributes, costs*, and *benefits* [15]. This synthesized framework enables researchers to examine various motivators at the same time and predict more about an individual's motivation from multiple aspects.

Card-based tools have been utilized in the Human-Computer Interaction (HCI) community as supportive tools for ideating creative solutions, facilitating design processes, and supporting education [31]. In particular, Fedosov et al. developed the Sharing Economy Design Cards to assist designers in creating innovative services [11]. Through four workshops [3], Bilstrup et al. found that teenagers can reflect on ethical dilemmas by designing their own machine-learning applications with three decks of cards and templates. Digital card games have been created to aid computer science education in topics such as programming, artificial intelligence, software development, and the binary system [20]. To summarize, cards are versatile tools for both practitioners and end users, creating a more collaborative, interesting, and appealing user experience [20].

Previous studies have attempted to introduce motivation in HCI with card-based tools, but they have a few limitations. Chasanidou and Karahasanovic proposed the DEMO cards for designing strategies to increase user engagement with innovation platforms [6]. The cards might trigger creative strategies, but they contain a limited scope of motivators. They only include one aspect of motivation ("expectation"), and 14 factors with icons, lacking explanations of the selected factors [6]. Schmidt et al. created the Motivational Design Cards for game-related motivational design tasks, but they provided an insufficient rationale for selecting these 22 factors specifically, and their card set is not publicly available [32]. Building upon these previous studies, we designed a more inclusive card set based on the synthesized motivation framework, and we introduce this card set in this paper.

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2 Design Process for Motivation Cards

We went through the following key steps in the process of designing our cards: refining the cards' purpose [27], excerpting motivational factors for inclusion, developing visual design elements [31], pretesting the cards [25], and redesigning the cards according to the collected feedback [19]. We provide a detailed account of each of these steps in this section.

Step 1: Refine the purpose of motivation cards and excerpt motivational factors

In the initial phase of our design process, we established the user profile of cards as practitioners, researchers, and end users who may not have been trained in psychology. The cards are intended to provide individuals with stimuli and simple explanations for identifying and reflecting on various motivational factors in different scenarios. The proposed features of motivation cards include a categorization that reflects the different aspects of the synthesized framework, facilitating ease of understanding, versatility in multiple scenarios, and visual appeal for users.

30 motivational factors were excerpted from the synthesized framework [15], which served as a starting point for translating theories of motivation into cards. However, only half of the factors were defined or explained in the framework [15], so we searched for the respective definitions and explanations from APA dictionary [1], encyclopedia [4] and peer review journals. To make the explanations of these factors more accessible to users, we paraphrased the explanations in the first-person narrative.

Step 2: The features of motivation cards 1.0

We used the design tool Figma to convert the factors from the text into card format. When designing the cards, we considered several elements, including the implementation of color coding to differentiate the seven aspects of motivation. Additionally, a consistent font in varying sizes was employed to enhance readability. Illustration icons were also incorporated to visualize the factors and grab users' attention.[1] In version 1.0 of the cards, we arranged one to four factors on each card to include 30 factors on 12 cards.

Step 3: Pretest motivation cards in a focus group

To evaluate the usefulness and usability of our motivation cards, we pretested the cards in a focus group. The participants consisted of five researchers and two interns who were employed by a European university. The focus group was planned to explore the factors that motivate or discourage employees' engagement with phishing interventions, including online security courses, simulated phishing tests, and reporting suspicious emails.

Procedure: First, participants utilized motivation cards and a template to identify the factors that motivate/discourage them from engaging in a self-selected leisure activity. Second, a group discussion was held regarding their engagement with phishing interventions. Third, participants filled in a conclusion table that summarized the factors they found relevant to them; and they were free to choose whether or not to use motivation cards based on their own preferences. Fourth, we asked the participants to provide feedback regarding the design of motivation cards and the focus group.

Data collection and analysis methods: We captured audio and video (148 minutes) recordings of the focus group and collected the filled templates of "what motivates you" and conclusion tables. The audio recordings were transcribed using the Microsoft Transcribe Service, and transcripts were reviewed for accuracy. Subsequently, the transcript and recorded video were analyzed multiple times through a process of taking notes to track the researcher's thoughts and highlighting meaningful segments. We took a deductive approach to code the meaningful segments [2], adapting motivation cards as the codebook for the coding process.

Results: In terms of the usefulness of motivation cards, they were found to support participants in completing the templates for both leisure activities and the conclusion table on the discussion. Participants reported that the cards triggered factors that may not have been considered otherwise. Three out of six participants used motivation cards to complete the conclusion table. When we compare the codes generated from the discussion transcripts and the conclusion table, three additional motivational factors were mentioned in the conclusion table by two participants who used the cards.

In terms of usability, the participants had mixed reactions. One challenge identified by the participants was that certain pairs of factors were difficult to differentiate based on the simplified explanations provided (e.g., agency and autonomy). Participants expressed that they appreciated the visual cues, such as icons and color coding, but had a preference for cards that contained only a single factor (refer to Appendix A, analysis and quotations from the feedback session).

Step 4: Redesign motivation cards

To improve the quality of the explanation texts of motivational factors, we performed iterations of excerpting motivational factors and visual design. Following this, an index card was created to differentiate the seven aspects and ensure that only one factor was presented on the header of each card. To further assist users in gaining a deeper understanding of motivational factors, quotations from peer-reviewed papers, encyclopedia [4], and the APA dictionary [1] were added to the back of the cards. Empty cards were added for each aspect, allowing users to indicate new motivational factors. To ensure the quality of the simplified explanations, two senior researchers who have been trained in psychology reviewed all of the cards' explanations.

3 Motivation Cards 2.0

Motivation Cards 2.0 comprises three distinct components: an index card, 31 motivational factor cards, and seven empty

[1]The icons were from "Noun Project" with an unlimited individual subscription. https://thenounproject.com/

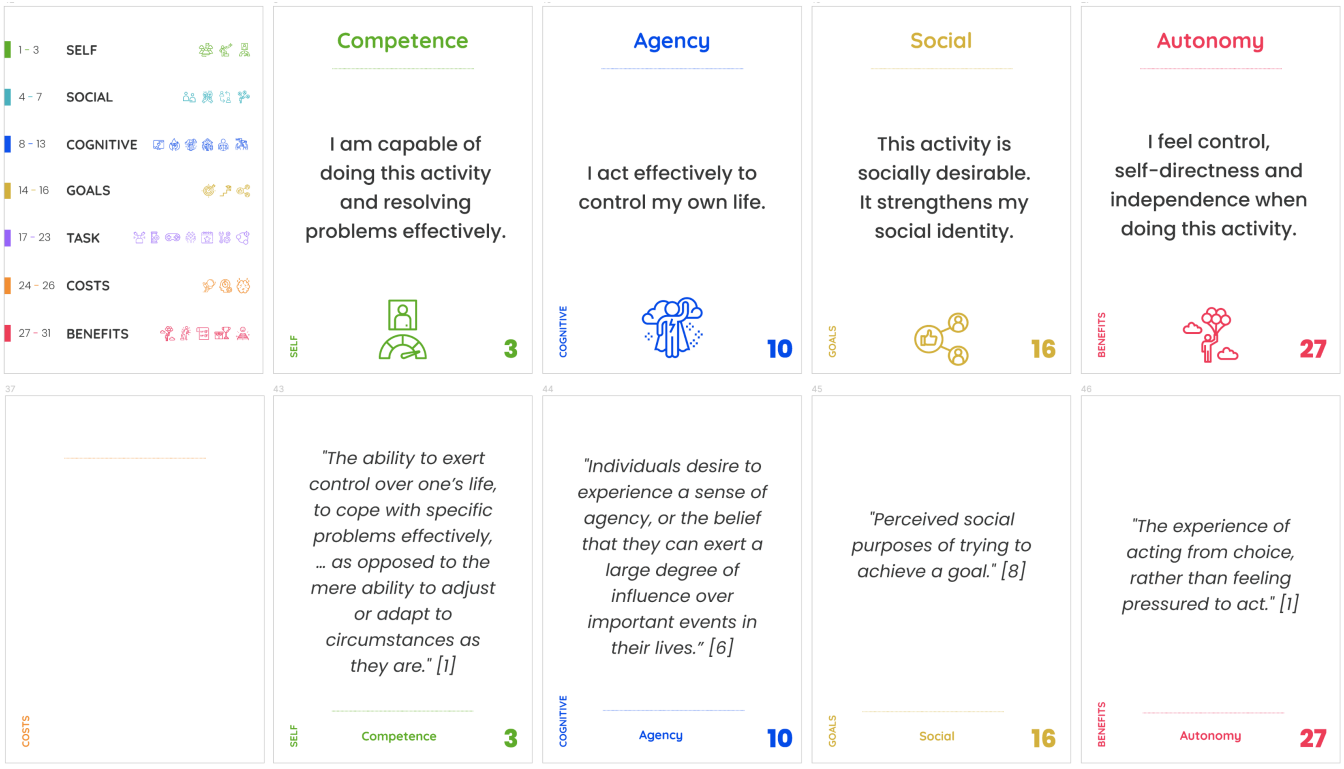

Figure 1: Illustration of Motivation Cards 2.0.

cards. This section will provide an overview of each of these components and their purpose within the overall design of motivation cards.[2]

Index card: We apply a color-coding system to categorize the 31 motivational factors according to the following seven aspects: self, social, cognitive, goals, task, costs, and benefits [15]. We make two modifications to the original framework. First, we re-categorize the "core value" factor from the benefits aspect to the cognitive aspect based on our focus group findings that participants primarily considered "core value" as a cognitive premise for decision-making in their narratives. Second, we add "feedback" to the cognitive aspect, as it was frequently discussed by participants as a motivational factor and supported by relevant literature [5]; hereby increasing the number of included factors from 30 to 31. The reference list for all factors can be found on the back of the index cards [1, 4, 5, 9, 10, 15, 17, 18, 28, 33].

Factor cards: A factor card consists of two sides. On the front of the card, there is a highlighted motivational factor in the header, a simplified explanation in first person narrative, an icon that matches the factor, the card number in the right corner, and the respective aspect that this factor was classified into in the left corner (as shown in Figure 1; the bottom row of Figure 1 shows the back of the cards). On the back, it presents a quotation from a reference, the factor, the card number, and the respective aspect in the footer.

Empty cards: We included empty cards for each aspect, based on our pretest study, which revealed some factors that are relevant in a given context which might not be included in the synthesized framework [15]. The empty cards allow future users to add new factors to the card set conveniently.

4 Brainstorming Session

To evaluate the usability of motivation cards 2.0 in mapping an individual's motivation and ideate on study opportunities of using the cards, we conducted a brainstorming session with five participants, including one UX designer and four HCI researchers.

Procedure: The brainstorming session consisted of two tasks and a feedback discussion. In the first task, which lasted 15 minutes, participants were instructed to write an activity they enjoy doing and spend much of their leisure time with, then sort motivation cards into four columns on a template: "a) factors that motivate you", "b) motivations that you need more", "c) factors that might discourage you", and "d) factors that are irrelevant". In the second task, which lasted 25 minutes, participants were divided into two groups and instructed to ideate potential study designs with motivation cards to

[2]Download the *Motivation Cards*: https://osf.io/x29gf/

investigate factors influencing employees' engagement with reporting suspicious emails. The session concluded with a 36-minute feedback discussion on their user experience with the cards and the perceived advantages and disadvantages of utilizing the cards in future studies.

Data collection and analysis methods: We collected five templates filled with the activity and picked card numbers from the participants. The brainstorming session was recorded with the verbal consent of the participants. The templates were used to assess whether the participants were able to sort the cards into different motivation categories. The audio recordings were transcribed using the Microsoft Transcribe Service and reviewed for accuracy. The transcripts were analyzed using an inductive coding approach [2], involving familiarisation with the data, generating codes, and identifying patterns.

Results: Participants chose different leisure activities and were able to select 7 to 18 relevant motivating factors for their activities, with an average of 14 motivators. Additionally, the number of cards deemed irrelevant to the chosen activity varied, ranging from 6 to 14, with an average of 9. A bar chart analysis showed that motivating factors for the chosen leisure activities were randomly attributed. "Satisfaction", "pride", "autonomy", "value", "social" were among the most selected motivating factors. Conversely, factors such as "self-regulation", "extrinsic motivation", "relatedness", and "opportunity costs" were considered irrelevant to the chosen activities (see Appendix B for more detail).

Several research opportunities were proposed in the ideation task. These included planning co-creation sessions to improve the phishing reporting procedures by appealing to more motivating factors, organizing workshops with employees who do not typically report suspicious emails, and examining factors that influence their decision-making with motivation cards. Ranking exercises were also suggested, asking participants to provide explanations for the sequence in which they arranged the cards. One participant suggested combining motivation cards with individual interviews to examine an individual's motivation in depth.

During the feedback discussion, all five participants expressed positive comments about the visual design of the cards, such as the illustrations, headers, color coding, and the use of first-person narratives. The participants reported that the cards were easy to understand, but 31 cards made it cognitively demanding to navigate through in a short time. P4 expressed concern that, despite the simplified explanations provided, it could be challenging for users to utilize the cards for activities in which they lack motivation. Additionally, P1 mentioned that after intuitively selecting motivation cards, they need extra time to fully understand why they picked these factors. Nevertheless, P3 found the cards to be very helpful in identifying their motivation and reported that with the support of the cards, they realized some factors they were previously unaware of. P3 requested one set of motivation cards for personal use after the session. They planned to explore their motivation in self-learning longitudinally.

5 Discussion

We present the design process and user evaluations of motivation cards as a tool for mapping an individual's motivation regarding different activities. We translate a synthesized framework of motivation theories from educational psychology into a card set and examine its advantages and limitations in applying them to future studies. Our design process was rigorous, following the practices of previous card designing studies [19, 25, 27]. Compared with prior studies of introducing motivational factors in card-based format to the HCI community [6,32], our cards are based on a synthesized framework and include more aspects of motivation.

Motivation cards can be used to improve learner's engagement with S&PE solutions. To create engaging learning experiences, it is important to consider individuals' motivation in interaction design [23]. Integrating design elements (e.g., competition, feedback, and fun) fulfilling intrinsic motivation in online security training leads to higher levels of motivation and immersion [34]. Previous studies have proposed creative approaches to engage different demographic groups with S&PE, including serious games [14], role-playing [35], group discussion [8], and interacting with privacy-centric artifacts [24]. However, individuals' internal motivation has been an under-investigated topic in security interventions, which has predominantly focused on external motivators such as fear appraisals [26]. Motivation plays a critical role in behavior change and sustaining a behavior [12, 13]. We found that participants were able to identify and reflect on their motivation explicitly with the support of motivation cards. We propose to utilize motivation cards as a supportive tool to map individuals' motivation in interacting with potential S&PE solutions, hence engaging individuals with such solutions by strengthening identified motivating factors.

Educators can use motivation cards to create security and privacy behavior interventions. User evaluation suggests that motivation cards can support participants in categorizing their motivational and discouraging factors regarding an activity. Participants reported that the cards were easy to understand and triggered them to reflect on motivational factors that they were unaware of. S&PE aims to cultivate more secure and privacy-preserving behaviors in learners within specific contexts. Educators can utilize motivation cards to guide learners to explore various motivational factors relevant to the contextual behaviors they seek to intervene, such as "disclosure information to unknown actors" [21]. When relevant motivators are revealed, this provides opportunities to reduce those related to disclosure and enhance those that promote the protection of online privacy.

The current study has several limitations. First, the synthesized framework [15] includes only five motivation theories and is incomplete. Future research may need to consider in-

corporating additional motivational factors into the card set. Second, we use a convenience sample for user evaluation, the participants in this study were colleagues of the authors. By publishing motivation cards, we call for external evaluation of their usability across diverse demographic groups. Third, we only tested the front design of motivation cards 2.0 in the brainstorming session because the back side design was still in development. We suggest future evaluations plan longer study times for participants to familiarize themselves with various motivators. Fourth, participants proposed future study opportunities with motivation cards, including co-creation workshops, ranking exercises, and interviews. These require further empirical testing.

To conclude, we introduce motivation cards as a useful tool for researchers and practitioners to map individuals' motivation to engage in an activity. We present our process of translating a synthesized framework from educational psychology into a card set and discuss the potential of utilizing the tool to engage learners with S&PE solutions. Motivation cards can be applied to map motivators that influence learners' security and privacy behaviors, providing opportunities to intervene such behaviors. Motivation is a relevant topic in many application fields, and we believe motivation cards may also be useful for researchers from other areas of HCI.

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A Analysis and quotations from the feedback session

Advantages of using the cards: The participants liked the simplified explanations and visual designs (color coding and icons) of the cards. The participants found the cards supported them in discussing the factors that motivate or discourage them in the context of phishing. We attached some quotations from the participants:

- "I like the design; the cards are beautiful. I enjoy participating in the focus group." (P6)
- "The visual cues (icons) of the cards enable me to recall the abstract concepts easily." (P4)

- "There are definitely some points on the cards that I wouldn't have considered if you had not given me the information, then I would not have put this in the context of phishing." (P2)

The disadvantages of the cards: The participants found that 30 factors are cognitively demanding for them to process, and some cards have three to four items that require extra cognitive load from users. One participant reported that using the cards to complete the task makes the task more complex. One participant showed concern that the cards might prime the participants too much in designing future studies. Here are some quotations from the participants:

- "Multiple factors on one card make it difficult for me to process and pick the ones that fit my case." (P4)
- "Getting a grip of the cards was really not easy... You hint that one might use the cards to fill in the conclusion table, but I think that, again, it's difficult to do it. We felt it is complex and requires so much more cognitive processing to use the cards to complete the task." (P3)
- "We have nearly 30 factors on the cards, then discussed around ten questions. After two hours, I feel very tired, cognitively overloaded." (P6)
- "To what extent are you worried about priming your participants with these cards?" (P7)

Suggestions from the participants: One participant recommended that having more time to discuss the cards will benefit the users to engage with the cards, and it is better to associate certain cards with a specific question. One participant suggested giving only three cards to each participant to reduce the cognitive demand. Others suggested bringing the cards into the longitudinal study or simply using the cards as the code book to analyze the open discussions. These are the quotations from the participants:

- "It may have helped to engage with the cards more if we had more discussions on them ... If you wanted me to get the cards in connection with the questions, it would have helped. If you had given me a specific one." (P2)
- "Let the participants pick three cards. And these three cards lead you through the discussions and make sure that all the participants have different cards." (P1)
- "You should explore the deep insights of participants rather than sticking to what the cards present when designing the study. Take the open approach in the discussion, then apply the cards in the coding process." (P3)
- "Use the cards in longitudinal studies and give the user time to interact with cards." (P7)

B Bar charts and table of brainstorming session

Table 1: The filled-in activity and sorted cards (n=total number of cards).

Participant	Activity	a) Motivate	b) Need more	c) Discourage	d) Irrelevant
P1	Playing music	13	1	3	14
P2[1]	Weight lifting	18	5	4	3
P3	Climbing	7	10	5	9
P4	Gardening	15	0	2	14
P5	Cooking	16	4	5	6

[1] P2 missed one card when filling in the template.

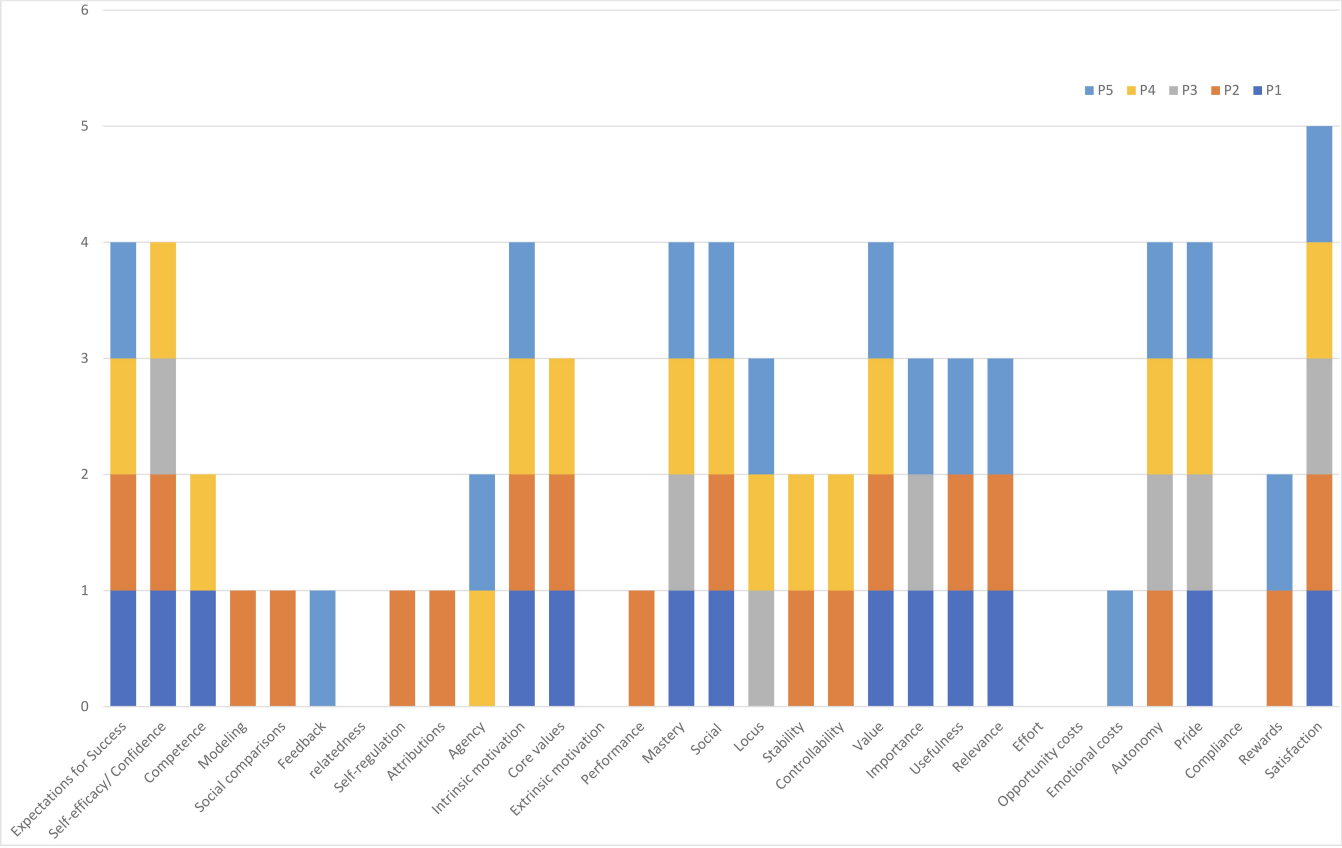

Figure 2: Factors that motivate participants.

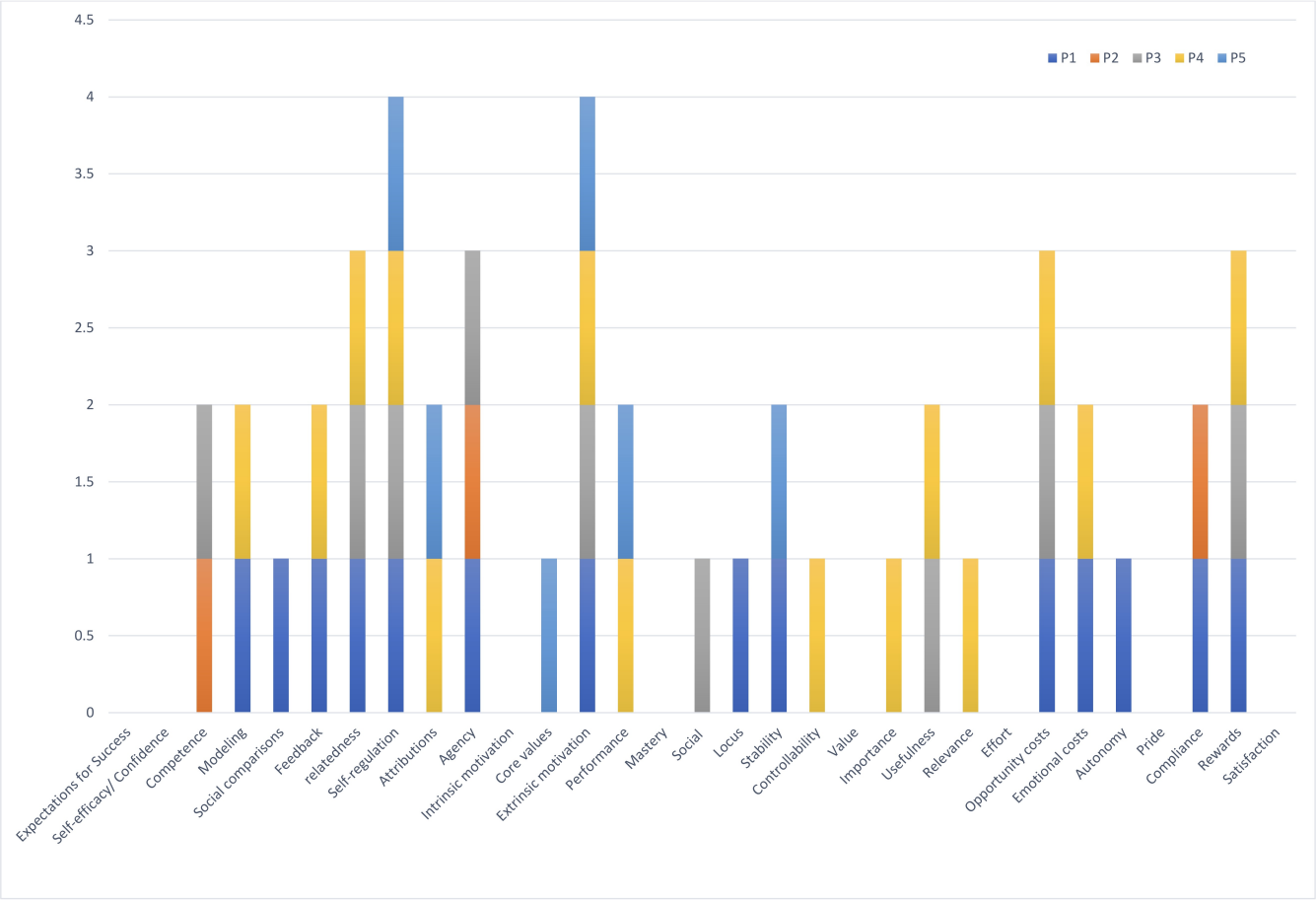

Figure 3: Factors that were considered irrelevant.