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# User Experience Evaluation of a Web Application to Estimate Employee's Well-Being Integrating Cognitive Factors into Work Situations

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**Abstract**

The concept of wellbeing as a key driver of performance and competitiveness in the long term is a crucial factor for companies to considerate into their employee's work situations. Wellbeing is, among other environmental and individual variables, depending on human cognitive factors like motivation or soft skills. These cognitive traits are generally evaluated online in an overall way, but none of them are contextualized into the company's structure. Researchers implemented a digital tool with participatory design method to evaluate the personality traits work-related that can impact the wellbeing of employees. The final step of the participatory design method was to evaluate the user experience. First, regarding the digital tool researchers developed (test application). Then, on a personality test online (control application). Two questionnaires were used: a 'completion sentence' self-evaluation and the user experience AttrakDiff. This paper's results highlight that AttrakDiff questionnaire, administrated to  $n = 26$  employees, showed higher scores in both its components, i.e., with higher hedonic and pragmatic qualities for the test application than for the control application evaluated. The 'Completion sentence' questionnaire highlights complementary components like fear, identification, content utility and usability, emotion, weakness, perceived expectations. In future work, these results will be considered to improve the web application implemented in content and design. This preliminary work confirms the interest of participatory design to foster companies to develop personal

digital survey composed of specific cognitive human factor units to optimize wellbeing into work situations.

### **CCS Concepts**

• **Human-centered computing** → **HCI theory, concepts and models**; **Pointing**; **Visualization techniques**.

### **Keywords**

User experience; Human factors; Intrinsic motivation; Participatory design; Soft skills; Well-being.

### **Résumé**

Le concept de bien-être en tant que levier de performance et de compétitivité à long terme est un facteur crucial pour que les entreprises en tiennent compte dans les situations de travail de leurs employés, et dépend de facteurs cognitifs humains comme la motivation ou les compétences transverses. Ces traits de personnalité sont généralement évalués via des questionnaires en ligne génériques, mais aucun d'entre eux n'est contextualisé selon l'organisation de l'entreprise. Les chercheurs ont développé un outil numérique avec une méthode de conception participative pour évaluer les caractéristiques cognitives liés au travail qui peuvent avoir un impact sur le bien-être des employés. L'étape finale de la méthode de conception participative a consisté à évaluer l'expérience utilisateur (UX). D'une part, concernant l'utilisation de l'outil numérique développé (application test) et d'autre part, sur un autre test de personnalité en ligne (application contrôle). Deux questionnaires d'évaluation ont été utilisés : un questionnaire de « complétion de phrases » et le questionnaire UX AttrakDiff. Les résultats de cet article mettent en lumière le fait que le questionnaire AttrakDiff, administré à n = 26 employés, a obtenu des scores plus élevés dans ses deux composantes, c'est-à-dire avec des qualités hédoniques et pragmatiques plus élevées pour

l'application test que pour l'application contrôle. Il révèle que l'expérience utilisateur générée par l'outil numérique mis en œuvre est plus positive. Le questionnaire de « complétion de phrase » met en évidence des composantes complémentaires comme la peur, l'identification, l'utilité et la convivialité du contenu, l'émotion, la faiblesse, les attentes perçues. Dans les travaux futurs, ces résultats seront pris en compte pour améliorer l'application web mise en œuvre, en termes de contenu et de design. Ce travail préliminaire confirme l'intérêt de la conception participative pour favoriser les entreprises à développer un outil numérique composé de critères cognitifs d'auto-évaluation afin d'optimiser le bien-être dans les situations de travail.

### **Mots-clés**

Expérience utilisateurs ; Facteurs humains ; Motivation intrinsèque ; Conception participative ; Compétences transverses ; Bien-être au Travail.

### **Introduction**

#### *Industrial context*

The issue of well-being at work became decisive for companies that increasingly seek to develop the feeling of balance and serenity among their employees to make it a lever for performance and competitiveness. Nowadays, a lot of companies organize their work in project teams. When the workforce of these companies increases fast, the integration of the most suitable employees into projects is more complicated. Moreover, soft skills are more and more regarded in the professional environment because they are described as a major factor of success. They are responsible for 75% of long-term professional success against 25% for technical skills [1], [2]. In a context of digital service company, which is mainly composed of project teams, researchers aimed to promote soft skills and human factors in the performance of project teams and the well-

being of employees. The challenge was to reintegrate the cross-functional skills of employees in the team building process and to promote the integration of new employees. To do this, a web application to self-evaluate human factors of employee like soft skills or specific cognitive traits was a potential solution.

#### *"Beyond the Wellness" project*

Beyond the Wellness is an internal web application for employees in a digital company. The project was part of a participatory design (user-centered method) and co-construction approach [3]. On a voluntary basis, each employee can complete four questionnaires through a 4-point Likert scale (Figure 1): types of motivation (intrinsic, extrinsic or amotivation) [4], [5], stress management (desirability of control and coping strategies) [6], [7], soft skills (flexibility, open-mindedness, emotional intelligence, extraversion trait) [8], [9], and number of projects preferred (i.e. simultaneous activities carried out). Criteria were determined from a literature review on human factors that have an impact on performance and relationships at work.



**Figure 1.** Landing page of "Beyond the Wellness".

Results were displayed for each criterion in "my statistics" part. The interest of this type of tool is to be able to

contextualize and gamify questionnaires to make them more related to their work environment but also more attractive. Finally, indications about themes and results are available in a toolbox to guide the users and give them definitions and explanations.

The final step of the participatory design approach was the administration of user tests.

#### **Design evaluation**

The next session reviewed the UX assessment methods and tools relevant regarding the assessment tools used for user tests.

#### *Related work*

##### USER EXPERIENCE

The term "user experience" was first used in the 1990s [10], [11]. It broadens the field of usability which allows to cover more aspects (especially the emotional dimension) related to the experience of a user regarding a system. In the 2000s, Hassenzahl and Tractinsky [12] defined UX as "a consequence of the internal state of a user, characteristics of the system designed and the context in which the interaction takes place". Hassenzahl [13] suggests that UX emphasizes the positive aspects of the interaction between the product and the user, the non-instrumental aspect of the product (pragmatic qualities: usability and usefulness) and the understanding and management of the subjective aspect of use (hedonic qualities: stimulation, identification, and evocation). According to Lallemand [14], the UX model that was proposed by Hassenzahl in 2003 [15] is the most used in UX research.

##### ACCEPTABILITY

The notion of acceptability is defined as "the a priori perception that an individual has of the value of a system or

technology" [16]. It is a question of assessing the future acceptance of a new system before its actual implementation. Acceptance is associated with the proven intention to use an established and available technology or with the actual behavior of users towards it. For this project, acceptability will be considered because the application "Beyond the Wellness" has not been carried out yet.

#### UX ASSESSMENT METHODS

UX scales are standardized self-assessment questionnaires which allow the experimenters to collect the feelings, the perception, and the experience of the users facing a product or service. These instruments are based on theoretical models [15], [17]. They are valid, faithful, and consistent because of their link with this research work. There are other UX assessment methods as interview method [18]–[21], UX evaluation curve method [22], the 5 second test [23], the experience map method [24] or sentence completion [25]. This last UX assessment tool is a qualitative method which allows the exploration of users' needs, expectations, values, intercultural differences, etc. [25], [26]. Beginning of sentences is presented to the user who must then complete them as honestly as possible. The objective is to explore the quality of the user experience. There are no universal tools to analyze all the desired aspects of UX. For this project, the AttrakDiff questionnaire and the sentence completion method have been used.

#### *Methods and Measures*

##### ATTRAKDIFF

The AttrakDiff is a standardized questionnaire which is based on the theoretical model of Hassenzahl [15], validated in French [27], [28]. It is composed of 28 semantic differentiators, or pairs of contrasting words, which are associated with four sub-scales: pragmatic quality (PQ), hedonic quality - stimulation (HQS), hedonic quality - identity

(HQI), and overall attractiveness (ATT). The items are assessed using a 7-point Likert scale. To collect other types of data which will be complementary to those collected through AttrakDiff, an additional evaluation method has been implemented: the sentence completion.

#### SENTENCE COMPLETION

This UX method was developed by Kujala et Nurkka [25]. It is used to assess personality, attitudes, and affects. Beginning of sentences is presented to the user who will then have to complete as honestly and as spontaneously as possible. For the user tests of this project, the construction of the grid for the completion of sentences includes 8 dimensions (see Table 1) and 14 items: the overall UX, expectations, overall utility emotions, weaknesses of the tool, identification, fears, utility and usability of the application's content.

Dimensions	Items
Overall UX	When I use this tool, I feel...
	I find that the concept of the application is...
Expectations	For me to want to use this application, it would be necessary that...
Overall utility	I find this system useful for...
Emotions	I did not like...
	I liked...
Weakness	If I could make changes to this app, I

	would...
Identification	This application reminds me...
Fears	My fears regarding this application are...
	I wonder about...
Utility and usability	The different modules that I complete within the application are...
	Navigation within the application is...
	The definitions in the toolbox are...
	If I could add a module related to the human factors to be evaluated, it would be...

**Table 1.** Construction of sentence completion evaluation.

An item must be clear, succinct, and precise to avoid off-topic answers. It must be also open enough to express ideas. The fidelity of the answers can be reinforced by using several sentences to evaluate the same aspect. Pre-tests took place to validate the formulation and understanding of the items.

#### *Procedure*

##### POPULATION

User tests were carried out with 26 employees of a digital company. All the participants used the application test and the application control but in a randomized order to avoid bias. For this, two proportional groups were composed (group A, N=12; group B, N=14) respecting male-female

parity and a mix of age groups (50%>40 years old and 50%<40 years old).

##### MATERIAL

For user tests, a comparative evaluation was carried out between the application test "Beyond the Wellness" and the application control called "Monkey Tie" (<https://big5.monkey-tie.com/>). This similar online application contains a personality test based on the Big Five personality traits [29] which is frequently used by human resources in companies.

##### PROCEDURE AND MEASUREMENT

User tests were done in home office environment with online tools. To evaluate the two applications, forms have been created using Google Forms. Pre-tests were carried out to validate the format of questionnaires. The "action" mode [30] of the experiment was preferred rather than following scenario of use because it is the manipulation of the system in terms of navigation and exploration that was highlighted.

The tests took place over two weeks, and instructions as well as reminders were sent regularly by email to users during this period. Group A had one week to explore and complete "Beyond the Wellness" and fill the associated UX assessment form online (which sent the last day of the test). Group B were asked to do same tasks but with the application "Monkey Tie". The next week, each group repeated the same tasks but for the other application not completed yet.

##### STATISTICAL ANALYSIS

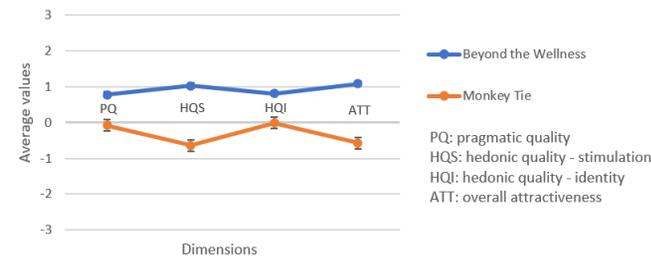
All data analyses were performed using the R software on paired samples. A significance level of 0.05 was used throughout the analysis process. Descriptive statistics were computed from raw scores on each questionnaire for each participant. For any mean comparison, the variance equality

was checked for performing parametric statistics. For each subscale, Student tests were used on the means obtained for the two applications.

## Results

### Attrackdiff

The comparative evaluation between "Beyond the Wellness" (BTW) and "Monkey Tie" (MT) was made with Attrackdiff questionnaire. Quantitative data for each item were analyzed.



**Figure 2.** AttrakDiff comparative evaluation between "Beyond the Wellness" (blue) and "Monkey Tie" (orange).

Figure 2 shows an average values diagram regarding the four sub-scales of the AttrakDiff for the two web applications evaluated. The effect of the questionnaire is significant for all subscales, with higher and positive values for "Beyond the Wellness": 1) In PQ's dimension ( $m_{BTW}=0.78$ ;  $m_{MT}=-0.08$ ;  $p<.005$ ); 2) In HQS ( $m_{BTW}=1.02$ ;  $m_{MT}=-0.64$ ;  $p<.001$ ); 3) In HQI ( $m_{BTW}=0.81$ ;  $m_{MT}=-0.01$ ;  $p<.001$ ); 4) In ATT ( $m_{BTW}=1.08$ ;  $m_{MT}=-0.58$ ;  $p<.001$ ).

### Sentence completion

Qualitative data were collected from the Sentence completion test and categorized to facilitate the analyze for participants who expressed similar idea. Among all the 14

items evaluated, Table 2 shows main verbatims expressed from participants for the "Fear" item in the two conditions.

Application	Category	Example of verbatims
BTW	Use of data (N=3)	"Scared on the big brother side"
	User engagement (N=2)	"People who will not complete questionnaires in the belief that no action or decision follows from them"
MT	Discouragement (N=5)	"The number of people who must be discouraged ...";
	Scientific foundations (N=3)	"A doubt on the scientific foundations"

**Table 2.** Sentence completion results extracted from the "Fear" item after using "Beyond the Wellness" (BTW) and "Monkey Tie" (MT): "My fears regarding this application are ...".

Regarding other items, some similar ideas have come up in user responses. For "Monkey Tie", half of the users did not like the redundancy and the length of the test ("I don't like..." item). For "Beyond the Wellness" 10 users over 19 did not like the colors used. For each application, most of the users find it interesting and nice ("I find that the concept of the application is..." item).

## **Discussion**

### *Interpretation*

Beyond the Wellness is an industrial web application of self-evaluation about cognitive factors that have an impact on the well-being, performance, and relationships at work. Research team evaluated the user experience generated in comparison with another web application well-known in human resources. Regarding AttrakDiff results (see Figure 2), the UX rating generated by “Beyond the Wellness” (BTW) is better than the one generated by “Monkey Tie” for each subscale. It means that the PQ, the hedonic qualities, and the ATT are better for “Beyond the Wellness” rather than for “Monkey Tie” (MT). Interestingly, values of BTW are positive while MT scores are negative, showing UX is better for BTW.

These quantitative data were completed with sentence completion, which was composed of certain dimensions of the Attrackdiff questionnaire. Regarding “Fear” item, the most represented category for the “*Beyond the Wellness*” application is the use of their personal (user) data. It means that most of users wonder and worry about this aspect. For “*Monkey Tie*”, the most represented category is the discouragement and the abandonment of the users. It means that users would not use the application even in short term. For other items evaluated (for example what users like, do not like, and what changes they would do) and combined with the AttrakDiff results, positive and negative elements were identified to analyze which ones influenced the UX generated. For example, the attractiveness of “*Beyond the Wellness*” can be improved by making changes on colors and design.

### *Limitations and perspectives*

First, the sample of participants was small (n=26). Nevertheless, in similar studies, UX evaluations following

scenario leads to a very controlled procedure with a larger number of participants but restricting the tool's uses and spontaneous patients' behaviors. We focused in "action" mode on the potential impact of the tool's use in a non-controlled environment, which is the most representative of ecological issues. Second, the AttrakDiff questionnaire did not replace observations. Quantitative data did not support the reasons for a positive or negative experience or the possible improvements of the given system. There could be inconsistency between observations made during user tests and the scores obtained on the UX scale. In further studies, the questionnaire will be completed with observations. Third, the categorization of user responses remains subjective and depends on the experimenters. In further studies, sentence completion categorized will be validated with the participant in the second step. Fourth, all the participants are employees of the company which support the study. This could bias results of the application test by increasing them. In further studies, participants will be employee of other company. Finally, the control application Monkey Tie is a platform composed of several assessments to retrain professionally. Thus, users had to register several data before accessing the personality questionnaire, which may have biased UX results. Further studies will be carried out with control application more accessible and validated such as the Myers-Briggs Type Indicator (MBTI) [31] or the Revised NEO Personality Inventory (NEO PI-R) [32].

## **Conclusion**

This study shows that the overall UX generated “Beyond the Wellness” is significantly better than the overall UX generated by “Monkey Tie”. A long and rigorous process carried out to successfully develop these tests. Literature reviews and workshops with final users were made. The user-centered approach makes it possible to define the needs and expectations of users. It also allows verifying and

validating every important step by iterating if necessary. The results of these user tests will provide opportunities and numerous concrete aspects to improve the UX and consequently the acceptability of "Beyond the Wellness" for the next version.

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