Appendix 1 – Autonomy and Competence in Technology Adoption Questionnaire (ACTA)

The ACTA questionnaire concerns why people adopt use of a technology (ie. download an app, register with a website, purchase a wearable device, etc.) and the extent to which they perceive they will be competent to use it. The ACTA is based on the Self-Regulation Questionnaire scales devised for other domains (ie. exercise, learning and healthcare) and the Perceived Competence Scales, both found on the self-determination theory web site.

The wording of the ACTA can be adapted to identify the specific technology in question. For example the text "decided to use" can be replaced with "downloaded", "purchased", or "registered for" as appropriate. Likewise, the term "technology" can be replaced with "app", "website", or the technology name, etc.

General Scoring Information for the ACTA. For the first set of questions, based on the SRQ scales, the responses on the autonomous items are averaged to form the autonomous regulation score for the target behavior and the responses on the controlled items (external and introjected) are averaged to form the controlled regulation score for the target behavior. For other SRQ versions, these two subscale scores are often used separately, but at times they have been combined into a Relative Autonomy Index (RAI) by subtracting the average for Controlled Regulation from the average for Autonomous Regulation. For the second set of questions (adapted from the PCS), a person's score is simply calculated by averaging his or her responses on the two items.

The Scale

There are a variety of reasons why people choose to purchase or start using a technology. Please consider the following and indicate how true each of these reasons is for you. The scale is:

1	2	3	4	5
not at all true		somewhat true		very true

Self-regulation

I decided to start using the technology because:

1. *Other people want me to use it.* *(external)*
2. *I expected it will be interesting to use.* *(intrinsic)*
3. I believe it could improve my life. *(identified)*
4. It will help me do something important to me. *(identified)*
5. I want others to know I use it. *(introjected)*
6. I will feel bad about myself if I didn't try it. *(introjected)*
7. *I think it would be enjoyable.* *(intrinsic)*
8. *I am required to use it (eg. by my job, school, research study).* *(external)*
9. *It is going to be of value to me in my life.* *(identified)*
10. *It is going to be fun to use.* *(intrinsic)*
11. I feel pressured to use it. *(external)*
12. It will look good to others if I use it. *(introjected)*

Perceived Competence

1. I feel confident that I'll be able to use the technology effectively.
2. The technology will be easy for me to use.

Appendix 5 – Validation of introduced measures

The ACTA, TENS-Interface, TENS-Task and TENS-Life introduced within the paper and as Appendices 1-4 are novel measures based on SDT-based questionnaires from other domains. To provide initial validation for these, we carried out a pilot validation study in which 400 participants in total (100 for each of four technologies) were asked to fill out each METUX questionnaire in reference to one of four possible technologies: Facebook, Google Docs, a music streaming service and a fitness band. Results showed satisfactory to good internal consistency for all questionnaires with alphas for subscales ranging from 0.66 to 0.88.

Specifically, we calculated Cronbach's alphas to test the internal consistency of the four questionnaires. Satisfactory internal consistency was seen in the Autonomy and Competence in Technology Adoption Questionnaire (ACTA) subscales with an alpha of 0.73 for the external sub-scale, 0.77 for the introjected sub-scale, 0.80 for the introjected subscale, and 0.82 for the intrinsic subscale.

For the three Technology-based Experience of Need Satisfaction questionnaires (Interface, Task and Life), satisfactory internal consistency was seen across subscales with alphas from 0.67 (autonomy) to 0.75 (relatedness) and 0.79 (competence) for TENS-Interface, and from 0.66 (relatedness), to 0.76 (autonomy) and 0.79 (competence) for TENS-Task. For the TENS-

Life questionnaire, good alphas were from 0.80 (autonomy) to 0.88 (relatedness and competence).

To further assess the validity of our model, we calculated the average correlation across the four technologies between the autonomy, competence, and relatedness subscales at each of the three spheres (Interface, Task, Life). Competence at the Interface correlated with competence at the Task an average of $r = 0.74$, and with competence in Life at $r = 0.56$, while competence at the Task and in Life correlated at $r = 0.57$. Autonomy at the Interface correlated an average of $r = 0.52$ with the Task, and $r = 0.61$ with Life, while autonomy in the Task and autonomy in Life correlated an average of $r = 0.69$ across the four technologies. Relatedness at the Interface correlated with the Task and Life at $r = 0.74$ on average, while relatedness in the Task and in Life correlated at $r = 0.64$. Correlations of this magnitude indicate that, as expected, the constructs are highly related and yet distinct at each sphere of the model, suggesting that these questionnaires can provide theoretically coherent, and novel information at each tier.

Additionally, we ran path analyses on the three TENS questionnaires to examine the pathways by which need satisfaction at the Interface, Task and in Life influence one another, and overall technology satisfaction. While a detailed discussion of these analyses is beyond the scope of this paper, the initial results indicated that need satisfaction at the Interface predicts need satisfaction in the Task and, often, need satisfaction in Life and overall satisfaction with the technology. Furthermore, since the model predicts engagement, successful technologies such as those tested would indeed be expected to show need satisfaction at Interface and Task, and these can be considered "gateways" to other satisfactions.

As we would expect, the relationships among these spheres and their links to overall satisfaction differed across technologies. For example, relatedness satisfaction in Life as a result of the use of Facebook

predicted overall satisfaction with Facebook ($\beta = 0.47$), but the same was not true for Google Docs. Thus, we would expect the profile of direct and indirect effects to be different for each technology.

While this pilot validation provides promising early evidence in support of the new measures proposed, please note, a more complete validation study is planned that will explore and describe the relationships, provide more reliable evidence, and refine the measures.