Adaptive and Reflective Training Support for Improving Search Behaviour in Industry 4.0

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Supporting users' training and thus improving their working productivity by increasing their search performance is crucial in every day's work-life. This holds true not only for knowledge workers like auditors, who needs to stay-up-to-date with law and new compliance regulations, but also for production workers who need to improve their IT skills in order to keep pace with new technologies established within the ongoing digitalisation in Industry 4.0 (Kleindienst et al., 2016). In both settings, there is a substantial need for workers to find work-related relevant information at the right time. To achieve this, especially production workers with low IT literacy as well as auditors, who need to keep track on the continuous change of laws and rules, need informal learning opportunities on how to improve their search capabilities during their daily work. In this work, we present a first design concept of an adaptive and reflective training support widget. The widget aims at supporting workers to train new search functionalities in order to enhance their search productivity during work.

We see a combination of social comparison, adaptive training support and prompts for reflective learning as a viable way. Users compare themselves to others in order to achieve certain goals or satisfy needs such as self-evaluation, self-enhancement, and self-improvement (Corcoran et al., 2011). Although the results of social downward and upward comparison are not unique, we see social comparison as promising approach for increasing learning and training to improve own behaviour. Adaptive visualisations in combination with self-regulated learning or reflective prompts aim at providing immediate and customized instruction or feedback tailored to the user's needs. Visualisations, like for example the Skillometers presented in (Malacria et al., 2013), allow users to pursue the development of their UI expertise by presenting past and potential future performance. Prompts in relation with self-regulated learning can induce a positive effect *'on learning behaviour and on transfer performance*' as shown in (Bannert et al., 2015), while reflective prompts *'offers learners a structured opportunity to examine and evaluate their own learning*' as stated in (Verpoorten et al., 2010) .This is also in line with Boud et al. (1985) who see reflective learning as the conscious re-evaluation of past experiences with the goal to learn from them to guide new behaviour; this change in behaviour provoked by the adaptive training support widget is the goal that we want to achieve.

In our case, a person wants to search for relevant documents necessary to complete her working activity. While she is searching, the platform tracks all her activities in order to provide her information on the fly in the adapted training support widget (see Figure 1). This widget provides adapted visualisations, performance indicators for social comparison as well as reflective prompts to raise awareness and to motivate to reflect about the individual training behaviour in order to induce a change in behaviour. The widget consists of a tripartite user interface with the goal to (i) visualize the to the current user behaviour (Fig. 1, top), (ii) provide motivation for improvement by comparison (Fig. 1, middle) and (iii) ask for reflection and action by adapted prompts (Fig. 1, bottom).

Visualisation: Feature Usage. This visualisation (see Fig. 1, top) presents the last five used search functionalities with the goal to raise the user's awareness of her feature usage and subsequently on her search behaviour on the search platform. The visualisation is permanently updated depending on the user's interaction in order to show a change of behaviour.

Comparison: Performance Indicator. The indicator presents a performance indicator, for comparing the own performance with the average colleague's performances. This could be for example the average time of features used or the search times used until the user has found the desired results. By providing this direct comparison, the user's intrinsic motivation to improve should be raised.

Guidance: Reflection and Recommendation. This part presents either a reflection amplifier to motivate to reflect on past user behaviour or a reflection intervention to motivate the user to use another search functionality. Both type of prompts are adapted to the user's preferences and user behaviour.

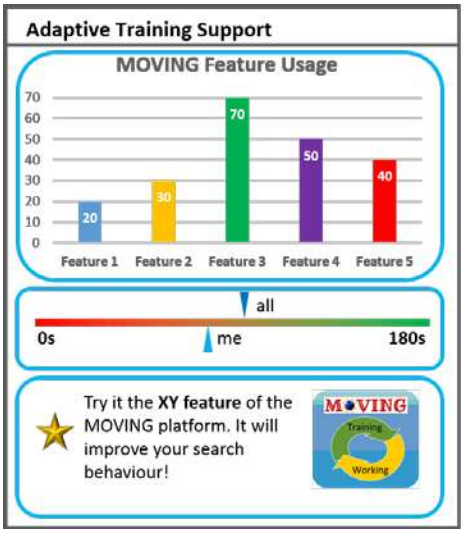

Figure 1: Prototype of Adaptive Training Support Widget

Currently, the adaptive training support widget exists only as a design concept in form of a clickable mock-up. In the next step, we plan to do a focus-group (Morgan, 1996) with potential target end-users in order to discuss with them i) the integration of the widget in their daily working environments, ii) relevant performance indicators adapted to their working activities and iii) the timing of reflection prompts. Based on these insights we will implement a first prototype on the search platform and continue with formal evaluations to improve the UI and functionality of the widget.

Acknowledgement:
The project ``MOVING - TrainInG towards a society of data-saVvy inforMation prOfessionals to enable open leadership iNnovation'' is funded under the Horizon 2020 of the European Commission (project number 693092). The Know-Center is funded within the Austrian COMET Program - Competence Centers for Excellent Technologies - under the auspices of the Austrian Federal Ministry of Transport, Innovation and Technology, the Austrian Federal Ministry of Economy, Family and Youth and by the State of Styria. COMET is managed by the Austrian Research Promotion Agency FFG.

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