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CATCHWORD

Advanced User Assistance Systems

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1 The Evolution of User Assistance

Information technology (IT) capabilities are increasing at an impressive pace, but users' cognitive abilities are not developing at the same speed. Thus, there is a gap between users' abilities and available IT. Handbooks or online help functions such as "F1 help" try to close this gap by providing explanatory information for the IT capabilities at hand. However, there is strong empirical evidence that traditional support structures are not as effective as intended (Sykes 2015); on the contrary, they distract users from their work (Barrett et al. 2004), which results in decreased efficiency and effectiveness as well as lower job satisfaction.

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Initial attempts to support users with more comprehensive integrated assistance functions failed miserably. A well-known example of such a dismal failure is "Clippy, the paperclip", a cartoon character developed by Microsoft that automatically popped up to assist users of Microsoft Office. However, instead of supporting the user with clear and precise guidance, studies show that Clippy "was considered to be annoying, impolite, and disruptive of a user's workflow" (Veletsianos 2007, p. 374). In the end, Clippy, the "non-intelligent artificial intelligence assistant", was so despised that even Microsoft made fun of it.[1] However, more recent attempts to support users, primarily in the private-life context (on mobile devices), are becoming more sophisticated and have been met with a more favorable response (e.g., Apple's Siri and Google's Google - Now). Moreover, Microsoft has integrated its personal assistant, Cortana, into the latest version of the operating system Windows 10, which is available for private and business environments.

One domain that is far more mature with regard to "user" support is the automotive sector. For more than 30 years there has been research into assistance systems that proactively support drivers (Bengler et al. 2014). Early driver assistance systems (DAS) only measured the parameters inside the car, for example with regard to vehicle stabilization (electronic stability control). Later on, sensors also captured the car's external environment. The use of the collected data, navigation systems, adaptive cruise control, and parking assistance can assist drivers in avoiding hazardous situations and increasing driver comfort. Advanced DAS, considered to be the third phase of DAS evolution, are about to become commercialized as

[1] http://steve-lovelace.com/microsofts-biggest-failures/. Accessed 26 Jan 2016.

growing numbers of various vehicles' sensors are able to communicate with each other and will enable automated, cooperative driving (Bengler et al. 2014).

User assistance in the context of information systems (IS) may leverage knowledge and learn from DAS. By tailoring assistance to users' current context and needs, more advanced user assistance systems can provide IS users with added value. Although there are various attempts in the IS field to study the effects of assistance and to provide concrete solutions in the form of prototypes, a great deal of research is still required. Thus, advanced user assistance systems are a promising research area that deserves more attention in the IS field. In this catchword, the topic is introduced by conceptualizing advanced user assistance systems from the perspective of IS research. It presents the first attempts to design modern assistance systems. Possible research directions that might be of value to the BISE community in particular are also discussed.

2 Conceptualization

Advanced User Assistance Systems (UAS) enrich information systems to help users perform their tasks better. As such, advanced UAS are seamlessly connected to or fully integrated with IS. Advanced UAS not only provide guidance or advice on a topic but sense the user's current activities and usage environment in order to provide features that are context-aware. They can also offer recommendations based on the user's context and activities and foster interaction between users and with the IS. Thus, UAS can be classified along two dimensions: (1) the degree of intelligence of the system, and (2) the degree of interaction enabled by the UAS. The dimensions and the resulting system classes are depicted in Fig. 1.

Based on the classification along these two dimensions, four different types of UAS can be identified.

Basic User Assistance Systems cover most of the early attempts to build UAS and feature low degrees of both intelligence and interaction. As such, this type of UAS is typically less integrated with the system that the user is currently working with, and basic UAS tend to rely on little contextual information. Consequently, their assistance tends to be rigid and to require manual execution by the user. Computerized versions of handbooks or user manuals fall under this class of basic assistance systems. They lack context awareness of the support that is provided and thus offer help that is not adapted to the users and their activities. Another example of these basic UAS is ITSM ProcessGuide, a process guidance system described by Morana et al. (2015). It provides process assistance to the users in a visual and textual format in order to improve IT service process execution.

Advanced UAS go beyond basic UAS and include more advanced intelligence and interaction capabilities. However, delimiting advanced UAS from persuasive systems does not enforce specific behavior on their users; instead, they guide them while performing a specific task. Another important characteristic which delimits advanced UAS from other existing systems is the degree of automation. UAS do not comprise systems that perform tasks entirely automatically or autonomously on behalf of the user. Advanced UAS comprise the following key characteristics:

- allow users to decide whether to follow the given assistance,
- provide context-aware assistance,

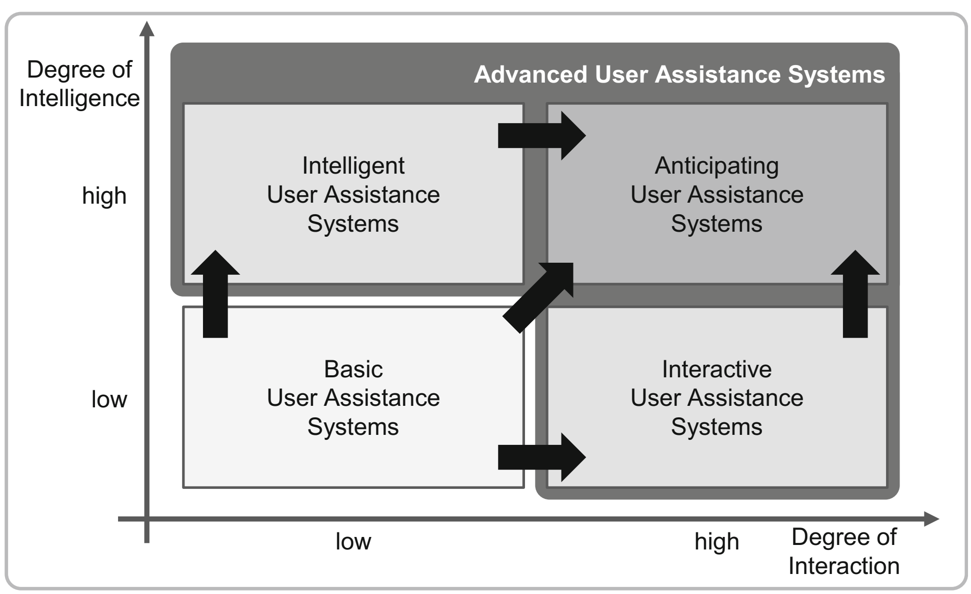

Fig. 1 Classification of advanced user assistance system

- provide proactive assistance,
- contain adaptation capabilities regarding assistance behavior (depending on the degree of intelligence),
- detect users' needs while receiving assistance (depending on the degree of interaction).

According to Fig. 1, three different types of advanced UAS can be distinguished: interactive, intelligent, and anticipating UAS.

Interactive User Assistance Systems build on basic UAS by means of strong interaction with the user. Typically, this kind of assistance still relies on rigid behavioral patterns that are manually and a priori defined by the system engineers. Nevertheless, unlike basic UAS which only provide assistance, interactive UAS provide assistance in cooperation with the users, for example by asking for feedback, providing feedback, or influencing the user during use. One prominent example is the gamified IS that support users by utilizing playful elements. For example, the Project World by Schacht et al. (2014) expands on a project knowledge management system with gamification elements to assist users while they use the system. Another example of interactive UAS is provided by Gass et al. (2015) in the form of a user-to-user support system that assists users of a customer relationship management system in utilizing the system. A further example is the KOMMIT UAS, which supports teachers, trainers, and students of vocational education in an e-learning environment to carry out teaching and learning processes by considering each individual's social media skills (Di Valentin et al. 2015).

Intelligent User Assistance Systems extend basic UAS by an intelligent component, which makes the system adaptive to their users and given context situations. By collecting and analyzing different forms of data, intelligent UAS are capable of adapting their assistance closely to the environment and preferences of the respective users. A common example of this kind of UAS are recommender systems (Pfeiffer 2012), which are well-established in the field of e-commerce. Two intelligent UAS integrating such a recommendation approach into enterprise systems are the research prototypes COPA and EXPORT. COPA helps users to conduct knowledge-intense, email-based business processes (cf. Burkhart et al. 2012), and EXPORT assists users in performing e-customs transactions (cf. Krumeich et al. 2015).

Anticipating User Assistance Systems combine high degrees of intelligence and interaction. Anticipating UAS exhibit very detailed situation and context awareness, and they anticipate future situations and events, on the basis of which assistance is proactively adapted. Ideally, this most sophisticated class of advanced UAS transparently informs its users about forecasted effects and about the effects of any alternative actions, if the provided assistance is adhered to. Moreover, they are strongly characterized by autonomous behavior, e.g., self-learning capabilities. Their assistance patterns and behavior are neither rigid over time nor fully defined ahead of time. Consequently, these UAS continuously adapt their behavior to users' needs and to given contextual situations. Furthermore, they offer highly sophisticated dialog interfaces that will eventually pass the Turing test. For example, recent research in the field of companion systems as described by Honold et al. (2014) discusses and presents the user- and situation-adaptive functionality of technical systems. They present a concrete prototype of an anticipating user assistance system in the private-life context of configuring a comprehensive and complex home cinema environment.

3 Research Challenges

Inspired by driver assistance systems in the automotive context (Bengler et al. 2014), the conceptualization, design, and evaluation of advanced UAS must to be carried out much more systematically in the field of IS in the future. First, further definition and conceptualization work looking at the different types of advanced UAS in the IS field is required. In the current body of knowledge, there is a vast amount of (heterogeneous) research on how to support users in their usage of IS. On the basis of existing research, the concept of assistance needs to be defined in greater detail, and a common conceptual foundation established. This foundation will then serve as the baseline to derive systematic suggestions and principles for the design of user assistance systems.

Second, various types of advanced UAS should be designed, implemented, and systematically evaluated. For the BISE community in particular, the design and evaluation of UAS in the context of large-scale information systems (e.g., enterprise resource planning) seem to signal a promising direction for future research. In general, research on advanced UAS can have a significant impact on society and business and position the BISE community as a thought leader for interdisciplinary research in cooperation with other research disciplines.

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