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Accounting for Interdisciplinary Requirements in Socio-technical Systems Design

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Designing successful socio-technical systems is a complex task. First, the potential value of such systems can only be leveraged if the systems are designed in a way that they are used by the intended users. Therefore, insights from research streams, such as user acceptance of technology and usability, should serve as an input for socio-technical systems design. Second, socio-technical systems need also be designed considering the current societal and regulatory conditions in the targeted social system. Therefore, e.g., current constitutional laws on data protection and informational self-determination should be reviewed to ensure that the socio-technical system is in line with these laws. Third, the insights from existing theories and the boundaries as defined by constitutional laws, need to be translated in a way that they can be understood and used by designers of socio-technical systems.

In the interdisciplinary research project VENUS at Kassel University, researchers from the disciplines computer science, human computer interaction, law and information systems tackled these challenges, and developed a method for considering insights from theory and laws during the development of socio-technical ubiquitous computing systems (see Figure 1).

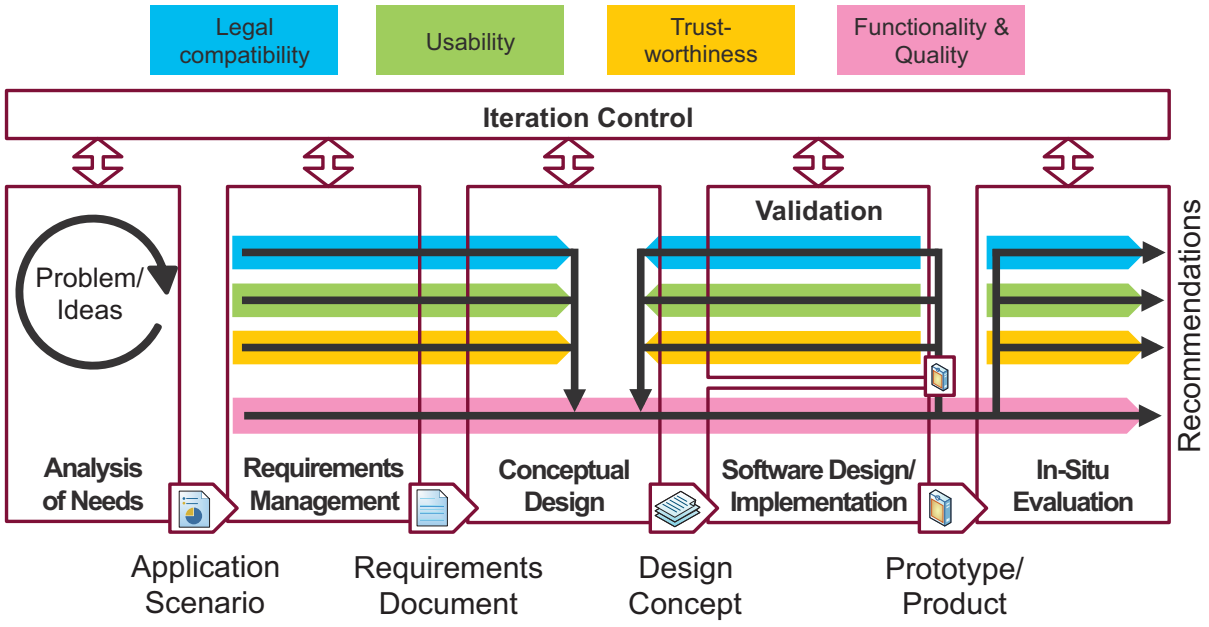

Figure 1. The VENUS method for socio-technical systems design (Roßnagel et al. 2014; Hoffmann et al. 2011).

To illustrate how the method – especially the consideration of insights from theory and laws – works, we will present details on how insights from trust theory (see the yellow stream in Figure 1) can be

used to develop more trustworthy socio-technical ubiquitous computing systems. Therefore, the insights from trust theory need to be translated into functional requirements that can be used as an input in any systems development process, and lead to the implementation of so called trust supporting components. Since this translation is usually challenging, the method of Söllner et al. (2012a) assists designers in deriving trust supporting components for a particular socio-technical ubiquitous computing system from trust theory (see Figure 2).

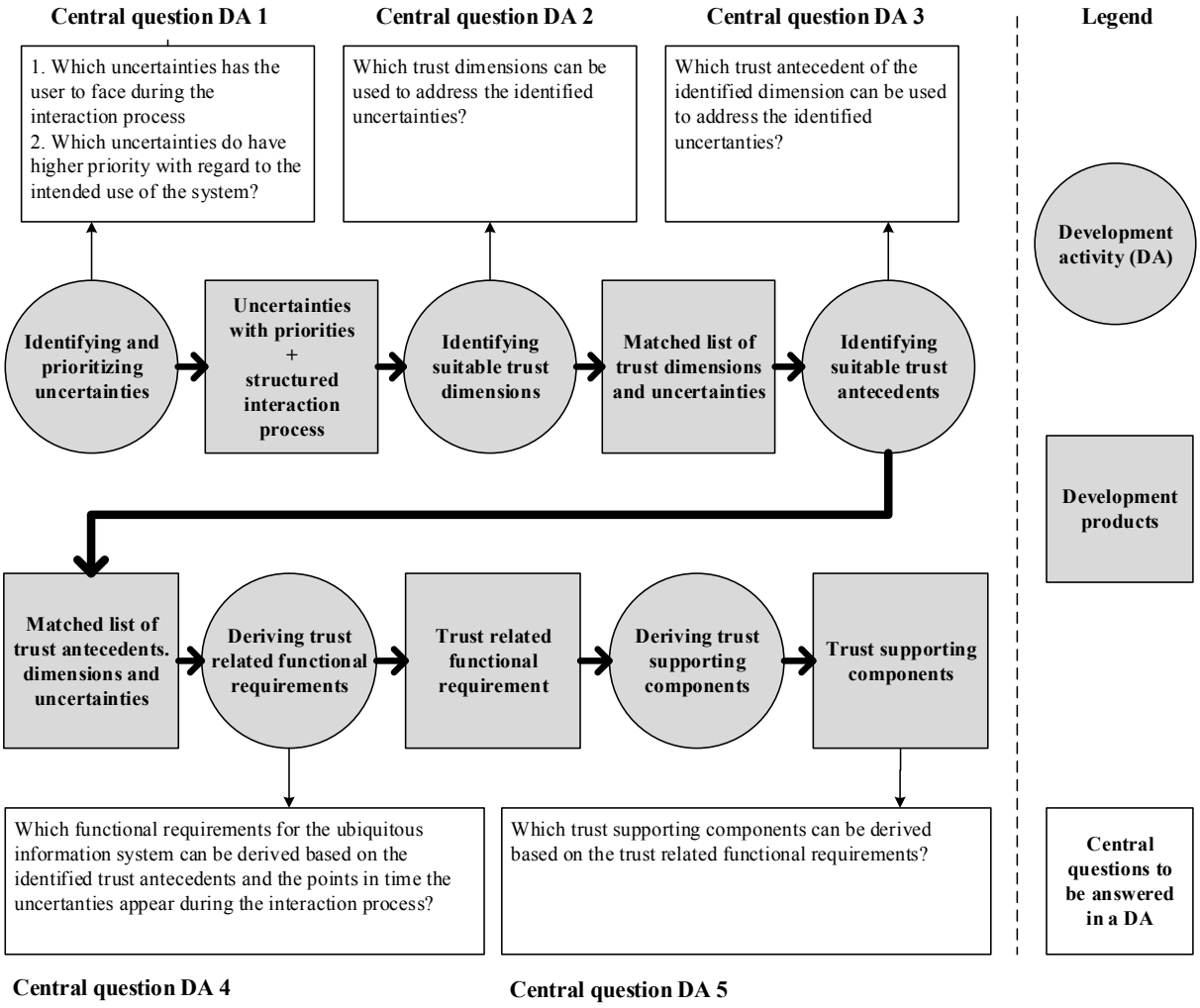

Figure 2. Method for deriving trust supporting components (Söllner et al. 2012a; Söllner 2014).

Trust is only necessary in situations that are characterized by uncertainty (Mayer et al. 1995; Luhmann 1979). Thus, in the beginning of the method, the uncertainties the users have to face during the interaction process are identified and prioritized. Furthermore, the exact moment in the interaction process in which each uncertainty arises is noted. Afterwards, insights on trust theory (see, e.g, Söllner et al. 2012b) are used to identify dimensions and antecedents of trust that are suitable to address the uncertainties. Once suitable antecedents are identified, trust related functional requirements can be derived based on the antecedents and the moment in the interaction process in which the particular antecedent needs to be influenced. Based on these requirements, trust supporting components can be derived. Our research has shown that the trust supporting components lead to a significant increase in the perceived trustworthiness of a socio-technical ubiquitous computing system, as well to an increased intention to use the system (Söllner et al. 2012a; Söllner 2014).

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