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Value Sensitive Design

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Human values impact people's information behavior. Imagine, for example, that a young Muslim man is interested in exploring the historical roots of jihad for a term paper. Imagine, too, that his library logs all digital reference interactions, and has a policy that if subpoenaed, such logs can be made available to law enforcement agencies. Under such conditions, this man might well decide to seek relevant information by other means, as he seeks to balance the value of access to information with other competing values such as privacy, consent, personal safety, security, and religious freedom. Despite the clear importance of values in human information behavior, the information behavior field does not yet have a comprehensive way of approaching this area. Value Sensitive Design offers one such approach.

Value Sensitive Design (VSD) emerged in the 1990s as an approach to the design of information and computer systems that accounts for human values throughout the design process (Friedman & Kahn, 1992; Friedman, 1997; Friedman, Kahn, & Borning, 2002). Two overarching goals motivate VSD: 1) to be proactive about human values in system design, and 2) to do so in a manner that is principled, comprehensive, and systematic.

VSD particularly emphasizes values with moral import, including privacy, trust, human dignity, respect for person, physical and psychological well-being, informed consent, intellectual property, access, universal usability, freedom from bias, moral responsibility, and moral accountability. While emphasizing the moral perspective, VSD also accounts for usability (e.g., ease of use), conventions (e.g., standardization of technical protocols), and personal predilections (e.g., color preferences within a graphical interface). Key features of VSD involve its interactional perspective, tripartite methodology, and emphasis on direct and indirect stakeholders.

VSD is an interactional theory: values are viewed neither as inscribed into technology (an endogenous theory) nor as simply transmitted by social forces (an exogenous theory). Rather, people and social systems affect technological development, and new technologies shape (but do not rigidly determine) individual behavior and social systems.

VSD systematically integrates and iterates three types of investigations: conceptual, empirical, and technical. *Conceptual investigations* comprise philosophically informed analyses of the central constructs and issues under investigation. For example, how does the philosophical literature conceptualize certain values and provide criteria for their assessment and implementation? What values have standing? How should we engage in trade-offs among competing values in the design, implementation, and use of information systems (e.g., access vs. privacy, or security vs. trust)? *Empirical investigations* focus on the human response to the technical artifact, and on the larger social context in which the technology is situated. The entire range of quantitative and qualitative methods used in social science research may be applicable, including observations, interviews, surveys, focus groups, experimental manipulations, measurements of user behavior and human physiology, contextual inquiry, collection of relevant documents, and interaction logs. *Technical investigations* focus on the design and performance of the technology itself. It is assumed that technologies in general, and information and computer technologies in particular, provide values that follow from properties of the technology. For example, an online calendar system that displays individuals' scheduled events in detail readily provides information about employees' availability, but makes privacy difficult. Technical investigations can involve either retrospective analyses of existing technologies or the design of new technical mechanisms and systems. The three types of investigations—conceptual, empirical, and technical—are employed iteratively in a way that the results of one type of investigation are integrated with those of the others, which, in turn, influence additional investigations.

Direct stakeholders refer to parties who interact directly with the computer system or its output. Indirect stakeholders refer to all other parties who are otherwise affected by the use of the system. For example,

computerized medical records systems impact not only the direct stake-holders, such as doctors, nurses, insurance companies, and hospitals, but an especially important group of indirect stakeholders: the patients.

Recent projects that have successfully drawn on VSD have focused, for example, on (a) network security; (b) the design of technological interactions to support informed consent; (c) bias in computer systems; (d) autonomy and privacy in hardware design; (e) the human-robotic relationship (with populations ranging from preschool children through the elderly); (f) privacy in public places that house Web cams; (g) military weapon information systems and the possibility of a just war; and (h) large scale urban simulation of land use and transporta-tion planning. Thus, from this growing body of research and design (see, for example, Friedman, 1997; Friedman, Howe, & Felten, 2002; Friedman & Kahn, 1992, Friedman, Kahn, & Borning, 2002; Hagman, Hendrickson, & Whitty, 2003; Kahn, Friedman, Perez-Granados, & Freier, 2004; Tang, 1997) there is evidence that VSD can be applied to a wide range of populations in diverse contexts, using diverse informa-tion systems.

Having emerged within the field of human-computer interaction, VSD currently lacks an explicit model of information behavior. That said, even at this point in its development, VSD can contribute to the field of information behavior in some key ways:

- *Explicit values analyses* – VSD—particularly through its conceptual investigations—can provide a framework for identifying the value components of a given information behavior theory or a specific information interaction.
- *Stakeholder analyses* – Many information behavior theories focus on the information seeker and the information giver but may ignore others impacted by these activities. For example, when caregivers seek medical information for a family member with AIDS, the family member may not want certain inquiries made (to protect privacy). Thus, by unduly focusing on the information behavior of the direct stakeholder (the caregiver seeking medication information), the researcher may miss important impacts of the information interaction.

- *Value conflicts within the individual* – It is clear from the psychological literature that people not only have multiple values, but these values often conflict internally (e.g., access versus privacy) (Turiel, 1998). VSD is committed to uncovering and representing heterogeneity and conflict within individual value analyses.
- *Value conflicts within systems* – Many times information behavior involves conflicts between individuals and systems. For example, online access to court records increases the convenience of public access to court records but may unduly expose the victims of crimes to unwanted or psychologically harmful publicity.
- *Values in context* – VSD maintains that how values play out in a particular culture at a particular point in time can vary, sometimes considerably. For example, privacy plays a central role in human development; yet what counts as private (financial information, first name) and how one signals privacy (facing the wall of an igloo, as the Inuit do) varies across contexts. Information systems sensitive to human values must account for these contextual dimensions.
- *Integration of system design with information behavior* – VSD offers an explicit approach to integrating empirical investigations of people's information behavior with the design of information systems responsive to that behavior.

The theory and methods of VSD are to be used in concert with other existing theories and methods. Ultimately, value-sensitive design requires that we broaden the goals and criteria for judging the quality of information systems to include those that advance human values.

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Vygotsky's Zone of Proximal Development

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Lev Vygotsky was a prominent Soviet developmental psychologist. A contemporary of Jean Piaget, his work was produced from 1924 until his untimely death in 1934. It was not accessible to Western scholarship until fairly recently; first, because it was suppressed in the Soviet Union, and subsequently, because it was not translated from Russian into English and other languages until the late 1960s and 1970s.

The general propositions of Vygotsky's developmental theory are that action creates thought, development results from dialectical processes, and development occurs in historical and cultural contexts (Thomas, 1992). Vygotsky's approach, like those of Bruner's scaffolding, Bandura's social learning theory, and Kaye's child-as-apprentice, is interactionist (Winter & Goldfield, 1991). To explain the relationship between learning and development, Vygotsky used the theoretical construct of the zone of proximal development (ZPD), which he defined as:

> the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers. (Vygotsky, 1978, p. 86)

Vygotsky postulated that new cognitive skills are first practiced by children in social interaction with a more experienced individual until the skill is mastered and internalized and the child is able to exercise the skill independently.