This dissertation presents and evaluates a method of managing spoken dialog interactions with a robust attention to fulfilling the human user's goals in the presence of speech recognition limitations. Assistive speech-based embodied conversation agents are computer-based entities that interact with humans to help accomplish a certain task or communicate information via spoken input and output. A challenging aspect of this task involves open-domain dialog, where the user is free to converse in an unstructured manner. With this style of input, the machine's ability to communicate may be hindered by poor reception of utterances, caused by a user's inadequate command of a language and/or faults in the speech recognition facilities. Since a speech-based input is emphasized, this endeavor involves the fundamental issues associated with natural language processing, automatic speech recognition and dialog system design. Driven by Context-Based Reasoning, the presented dialog manager features a discourse model that implements mixed-initiative conversation with a focus on the user's assistive needs. The discourse behavior must maintain a sense of generality, where the assistive nature of the system remains constant regardless of its knowledge corpus. The dialog manager was encapsulated into a speech-based embodied conversation agent platform for prototyping and testing purposes. A battery of experiments was performed on this agent to evaluate its performance as a robust, domain-independent, speech-based interaction entity capable of satisfying the needs of its users.