Agents: An Overview" in the *Knowledge Engineering Review* journal, Vol. 11, No. 3, pages 205-244.

There are ways already known for building software agents. For instance, the following publications describe agent building arrangements:

1. **IBM's Agent Building Environment (ABE)** which is essentially a C++ class library [http://www.networking.ibm.com/iag/iagwatsn.htm]. ABE is a tool-kit that facilitates the construction of agent-based applications or helps add an agent to existing applications. This tool-kit applies to relatively trivial "interface" agents, or agents that work alone. For example, an agent here could be one that which monitors the value of stock in the financial markets and alerts its user (e.g. via paging) when the value falls below a certain threshold. ABE does not describe means for building multiple agent systems, nor do they describe means for building more than one type of agent.

2. **MIT's SODABOT** [http://www.ai.mit.edu/people/sodabot/sodabot.html], General Magic's Telescript and Odyssey [http://www.genmagic.com], and IBM's Aglets [http://www.trl.ibm.co.jp/aglets]. These all provide other environments which facilitate the construction of "mobile" agents-based applications. However, they are also not much more than languages, comparable to the "Java" language developed by Sun Microsystems Inc., and do not provide specific advanced agent-building arrangements.

Perhaps more relevant to embodiments of the present invention is the agent building shell work done at the University of Toronto. This is described by Mihai Barbuceanu & Mark S. Fox in the paper "The Architecture of an Agent Building Shell", published in 1996 in *Intelligent Agents II*, Berlin by Springer-Verlag, 1037, 235-250 and edited by Wooldridge, M., Muller, J. & Tambe, M. This work describes an agent building shell "that provides several reusable layers of languages and services for building agent systems: coordination and communication languages, description logic based knowledge management, cooperative information distribution, organisation modelling and conflict management" (page 235). This work is still very much in progress and has not yet resulted in a practical embodiment with much effort having been expended on