Glycosylation of the conserved adaptor protein Skp1 regulates O2-sensing in the model organism, *Dictyostelium discoideum*. The final enzyme in this pathway, AgtA, possesses a previously uncharacterized WD40 repeat domain which has not been characterized in other glycosyltransferases. The function of this domain was investigated by enzymatic assays of purified proteins to define a Skp1-binding function that grants exquisite specificity of AgtA for Skp1 while also mediating a Skp1-dependent activation of AgtA’s glycosylation activity. Genetic manipulation of AgtA expression *in vivo* revealed an unexpected function wherein AgtA regulates *Dictyostelium* development independently of its enzymatic activity. Data indicate that a tight AgtA/Skp1 interaction regulates the interaction of Skp1 with other proteins, including other Skp1 glycosyltranferases, which are known to be required for proper development in response to O2. These data support a model in which the interaction of the AgtA WD40 domain with Skp1 contributes to both enzymatic and non-enzymatic functions required for optimal O2-sensing in *Dictyostelium discoideum.*