A theoretical cascaded systems model for Detective Quantum Efficiency (DQE) of Flat Panel Imagers (FPI) was developed for conditions relevant to radiotherapy imaging. By describing the imaging system as a series of cascaded stages where each stage represents a physical process in transferring x-ray, optical, or electrical quanta to the subsequent stage, a linear cascaded systems model can be used to predict imaging system performance. The detective quantum efficiency of individual stages describes how the spatial-frequency-dependent signal-to-noise ratio propagates through the FPI. In order to quantify physical parameters associated with various x-converters under a high energy (6 ~ 15 MV) radiation beam, both Monte Carlo stochastic simulations and empirical measurements were performed. Aliasing effects were incorporated in the noise spectral density showing characteristics of discrete sampling by the digital FPI. In addition, the extension of the model to account for the effects of the scattered radiation has been studied and preliminary results will be presented.