Cancer diagnosis and treatment have known great advance over the last few decades. Theranostics, as an emerging method that combines both the diagnosis and therapy of diseases, is currently a trend in cancer research and treatment that promises more effective and cost-saving applications. This innovative field encourages the development and utilization of multifunctional nano-scale particles for the delivery of imaging and therapeutic moieties. The reason for this is associated with the numerous benefits that nanocarriers offerin cancer treatment. Those include the enhanced permeability and retention (EPR) effect in tumor tissues, ability for surface functionalization, high surface-to-volume ratio that facilitates interactions with cells, improved pharmacokinetic profile and biocompatibility. Stimuli-responsive chimeric/mixed nanocarriers are a new class of advanced drug delivery nanosystems (aDDnSs), where the integration of functional biomaterials, e.g. amphiphilic copolymers, on already known nanoplatforms, e.g. liposomes, leads to the realization of a new class of nanomedicines for cancer theranostics.The types of stimuli that may be utilized for developing such nanosystems are of endogenous or exogenous origin, including heat, pH variations, redox potential, protein or protein concentration, light, magnetic field, radiation and ultrasounds. Whilst the functionality of these platforms arises from stimuli-responsive molecules that are embedded inside them, their overall behavior and in vivo fate strongly depends on the self-assembled properties of the different biomaterials that are combined to produce the chimeric system, which concern their thermodynamics, morphology, physical chemistry and biophysics. The field of Theranostics also suggests a treatment strategy for individual patients, encompassing personalized medicine and pharmacogenomics in order to build more efficient targeted therapies and aDDnSs are expected to play a key role in this endeavor.