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A well known method for studying the properties of Hilbert space operator(s) is by representing it(them) as simple operator(s) acting on an appropriate classical function space. In this setting we often exploit the holomorphic structure that this function space usually possesses. For this reason many of the basic operator theoretic results were developed for specific classes of operators acting on a variety of specific function spaces. In this talk, we will show that many of these fundamental notions and results, can be also developed in the context of general Hilbert spaces that possess a generalized frame (indexed by a locally compact group). These include but are not limited to: Carleson measures, sampling and interpolation, Hankel and Toeplitz operators, dilation results, etc. In the classical theory the generalized frame is often given by the family of all/some reproducing kernels, but we will present how similar results can be also obtained even for spaces that don't have any reproducing kernels. (Received September 08, 2014)