Computer-based interactive music systems date back as far as the late 1960s, but increasingly accessible technologies have prompted significant growth in interest in digital musical instruments (DMIs) over the last decade. To date, the designers of DMIs have generally borrowed paradigms from acoustic instruments or the field of Human-Computer Interaction (HCI). However, it can be argued that DMIs are a fundamentally different case and the suitability of these paradigms is debatable at best. For instance, DMIs lack the haptic feedback of acoustic instruments. Musical instruments are also highly specialized rather than general-purpose tools, and musical performance is not typically task-based. Additionally, Jordà notes that their designers have tended to focus on isolated parts of the problem, to the detriment of instrumental cohesion and character. While a few authors have considered DMIs as more fully rounded constructions, and the term 'composed instruments' has been used to describe the specification of the input–output relationship as an intentional act of composition, we argue that this is insufficient. Drawing on theories of affordance and ecological music creation, we thus describe an alternative model that considers DMI design as part of a broader compositional process that also includes text and hybrid acoustic/digital space. The traditionally distinct roles of designer, composer and performer are seen to blur, and the notion of composition-specific instruments is discussed. As an example of the model in practice, the interdisciplinary collaborative piece Desire Lines (for trumpet, prepared piano without pianist, and parasitic DMI) is described. This serves to aid an initial assessment of the model and its implementation, and informs some closing remarks on its limitations and future possibilities.