Additive Manufacturing (AM) technologies have defined a new paradigm in the field of manufacturing. The freedom of design in these technologies has brought new possibilities for the fabrication of parts with complex geometries. Despite the numerous benefits of AM, there are factors which limit the mechanical strength of AM parts such as porosity and surface texture in AM components which are fabricated using Laser Powder Bed Fusion (LPBF) method. These mesoscale imperfections that are the result of the fabrication process highly impact the mechanical strength of parts with miniature features such as Periodic Cellular Structures. In order to investigate the mechanical strength of AM parts, as the result of mentioned microscale imperfections, appropriate evaluation methods that are capable of quantitatively assessing these imperfections are required. X-ray Computed Tomography (CT), a non-destructive evaluation method, has shown high capabilities for providing useful and reliable geometrical information of both internal and external features of AM components. The challenges involved with the application of CT for assessment of AM component are also studied in this thesis. Apart from the contributions of this thesis on how CT may be used in the field of AM, the results of this thesis has provided insight into the design process of cellular structures. Providing essential information about the strength dependency of thin-walls as the result of mesoscale fabrication defects and how these defects are dependent on the selected material and design of the structure are the main contributions of this thesis.