This review provides up-to-date summary on the applications of linear optical couplers and interferometers for implementation of quantum photon state manipulation. Several important applications are discussed, including computing and enhanced measurements. The review is clearly written, contains comprehensive list of references, and it will be certainly appreciated as a valuable contribution by the research community.

 I have the following comments and suggestions:

 1) The review is fully focused on quantum effects, yet this is not reflected in the title. Consider changing the title to include word “quantum”.

2) While the review is focused on general concepts, it would be useful to instructive a short summary of practical experimental achievements and limitations. For example, what size of unitary circuit was demonstrated? What are the losses in practical devices, what is the minimum loss and best fabrication fidelity achieved in basic optical elements like a coupler? Then, do such imperfections present fundamental barriers on scaling of circuit complexity?

3) In Fig. 1, it would be useful to show a current image as 1(a), and add in 1(b) a practical on-chip realization (i.e. use cropped Fig. 1 from <http://dx.doi.org/10.1126/science.aab3642>). This will give the readers a visual illustration on the state-of-the art of photonic chip manufacturing.

4) When discussing spontaneous parametric down-conversion (SPDC) on page 2, it will be also useful to mention SFWM, and add recent reviews on integrated nonlinear photon sources: <https://doi.org/10.1515/nanoph-2016-0022> and <http://dx.doi.org/10.1016/j.revip.2016.11.003>

5) Sec. 3.3 mentions “fast switching” and “ultrafast measurement technique for time bins”. In would be good to give characteristic physical estimates of what “fast” and “ultrafast” are in seconds, Hz? What is the current technological level here, is it sufficient or further advances are needed?

6) Add a discussion of tomography <http://dx.doi.org/10.1038/NPHOTON.2011.283> and more recent works on sparsity concepts, i.e. <http://dx.doi.org/10.1364/OPTICA.3.000226> and <http://dx.doi.org/10.1364/OL.41.004079>

7) In Sec. 8, add characteristic efficiencies (i.e. xx%) of different types of detectors. Also for PNR, mention maximum achieved photon-number resolution, and also technical difficulties (i.e. much lower operating temperature for TES). Although there is no space for a detailed description in this review, yet providing several characteristic experimental numbers will be very helpful for the readers.

8) Check cited arXiv papers and replace with journal references if available – i.e. [78] was published as <http://dx.doi.org/10.1038/srep19489>

In summary, this paper is recommended for publication after authors consider the above comments.