

**Research Assessment Exercise 2020**  
**Impact Overview Statement**

**University:** [The Hong Kong Polytechnic University ]  
**Unit of Assessment (UoA):** [Electrical and Electronics Engineering (12) ]  
**Total number of eligible staff of the university in the UoA:** [39 ]

**(1) Context**

[The Department of Electrical Engineering was founded in 1937 at the Government Trade School as one of the core disciplines of the school as skilled technicians and tradesmen were needed to build up electrical infrastructure and machinery in Hong Kong. Later in 1996, the Department of Electronic and Information Engineering was founded to supply engineers in the emerging digital era. As of today, the two departments have a portfolio of world-class research spanning from fiber optics, power electronics, grid-level energy distribution, and other multidisciplinary fields where electrons and information theory are integral.

The major beneficiaries of the research from the UoA may be broadly classified into the following groups:

1) Private and semi-governmental organizations and entities: This includes industry in the local private sector, as well as industrial partners and clients in the Mainland and overseas. Semi-governmental organizations such as the Airport Authority in Hong Kong are also frequent clients of the UoA as they adopt new standards and/or technologies.

2) Government and Public Sector Policy Makers: This group includes the Hong Kong Government, as well as Mainland authorities at the federal, provincial, and city-wide levels.

3) The Media and General Public: The UoA engages with the public through traditional media avenues of public lectures, stories in print media, radio interviews, etc., as well as through emerging media and social media avenues such as webcasts, YouTube, Facebook, etc.

The types of impact generated by the UoA during the review period include, but are not limited to, the following:

1) Economic – Value creation has been evidenced by several start-ups (Amonics, PlugTech) and technological adoption by larger entities (MTR, Airport Authority, Huawei). Furthermore, some activities also lead to cost-reduction.

2) Public Policy – Evidenced by direct links between staff interactions with governmental agents and subsequent policy adjustments and amendments.

3) Societal, Environmental and Health – Through quality of life enhancements such as reduced traffic congestion and reductions in operational delay times. This in turn has demonstrably led to lower power consumption and improved satisfaction.

4) Professional practice and adoption of standards. Through training seminars, software development and other industrial activities that enhance the scholarship and skill of local and non-local professionals (HKIE).]

**(2) Approach to impact**

[The UoA has strategic policies and practices in place to ensure that non-academic beneficiaries are engaging with relevant staff on regular terms. This can be evidenced by the following examples:

(i) Through a mix of public and private communication channels, the UoA strives to be at the forefront of local and national policy efforts that provide opportunity for explicit impact and translational research. For example, staff at UoA12 are collaborating closely with industry and the Electrical & Mechanical Service Department (EMSD) on projects that are in-line with the infrastructure development plan set out in the *Smart City Blueprint for Hong Kong* for the next five years, and beyond. In late 2018, UoA12 collaborated with Anlev Elex Elevator Ltd. and EMSD to develop optical sensing networks for monitoring the critical components of the elevators in two Hong Kong Government buildings for predictive maintenance purposes.

(ii) Formal training courses and industrial workshops hosted by UoA staff, and supported by the UoA administrative units. The PolyU campus is an ideal environment to host training seminars for a range of local professionals on various relevant topics. These have been conducted over 50 times during the assessment period and cover things such as new software tools for professionals in the power industry (HK Electric and China Light & Power) and optical grating inscription methods for telecom suppliers (Huawei).

(iii) As a point of policy, the UoA maintains two External Advisory Boards which are composed of local professionals to engage with the UoA management teams on a semi-annual basis. These boards are composed of prominent local professionals in relevant organizations and corporations. Strong rapport from these meetings has led to tangible impact and translation of research to industry, as explored in the impact cases.

(iv) To support UoA staff who seek to improve impact, the departments have a range of initiatives such as 1) providing financial support for visiting non-local clients and partners. 2) Allocation of administrative support to workshops/externally visible events. 3) Appointment of a Visiting Professor of Engineering of Entrepreneurship from MIT who advises staff on an annual basis regarding translation research from lab to industry. 4) Flexible working conditions to allow for travel, consulting, activities outside the classroom.

(v) Frequent public lectures and workshops supported by the Hong Kong Institution of Engineers and the IEEE. During the assessment period, 10/13 – 9/19, the UoA hosted more 100 talks which were delivered by either UoA staff, or notable overseas collaborators from Europe and North America. These talks are held on week nights and are open to the public. Typically, the audience may include 50-100 engineers from local companies and agencies with relevant expertise. ]

### **(3) Strategy and plans**

[UoA12 is concerned with the advancement in knowledge for people, the planet and the sustainable interactions that are needed to interface between the two. This is hallmarked by our continuing strategy to support basic research and applied R&D to generate impact in people's lives. In the future, UoA12 will coordinate fundraising with other UoAs in PolyU and sister institutions for infrastructure and facilities as we realize that with the dynamic opportunities arising from the Greater Bay Area initiatives, scaling is of critical importance to success. ]

### **(4) Relationship to case studies**

[1] In the case of the Predictive Railway Monitoring System, the unit's systematic approach is clearly visible from the impact of the case. For example, the engagement of external advisors (iii) as long-standing department policy brought the MTR Corporation to the department and the HK govt's priority for safe and reliable transportation was a known opportunity for UoA staff (i).

2) Similarly, a Power Electronics team formed in 2005 and has been the primary contributor to the development of the EV technologies shared in this case study. Their frequent engagement with local professionals via (ii, iii, and v) led to opportunities for EV infrastructure at various places such as the HK International Airport. Further support from the UoA administrative staff (iv) has enabled the team to host other workshops to expand the reach of the team.

3) The success of the UoA's efforts to develop new high-speed communication protocols is attributed to excellent internal policy. The UoA's range of support was utilized by colleagues to facilitate the formation of spin-off companies and industrial engagement (iv). The staff involved were frequently allotted flexibility with teaching and working terms to develop relationships organically with the industrial community. This in turn is evidenced by the decade-long relationship with Huawei. It is also a key growth for Huawei in their R&D activities with universities (i).]