



# 2010-2011 R&D PROJECTS

**Project Reference** ITP/020/10LP

**Project Title** **RFID and Sensor-based Productivity Enhancement System for Human-operated Workplace (Government and Industry)**

**R&D Organisation** The University of Hong Kong

## Abstract

Human-operated workplaces have common needs to manage documents and assets. Losing track of objects sounds common but actually dampens the workplace efficiency and productivity. In cases like the Correctional Services Department and the Customs & Excise Department where critical assets are unaffordable to lose, or RTHK where the items in the archival libraries cannot be replenished, such damages could go beyond monetary losses. Despite RFID technology supports visibility of objects, it remains no easy way to resolve tracking at item level. Fundamentally, RFID without sensing against the complex operational environment cannot tell how the item occurs in the tracking event and who is operating on it, nor can it relate the event to the dynamic workflow for automation.

On the basis of RAE middleware, a successfully commercialized ITC project, this project further develops a Human-Operated Productivity Enhancement System (HOPE System) in which RFID and sensing technologies are integrated for better tracking intelligence in operational events where assets, humans and processes (AHP) are interrelated. The system will contribute to operational enhancements and hence better productivity through: (1) gaining visibility of AHP interaction; (2) enabling item tracking and improve its performance with smart asset carrier (SAC) systems; and (3) facilitating automation with the improved visibility infrastructure.

**Project Coordinator** Mr Edward Wong

**Project Reference** ITP/022/10LP

**Project Title** **E-Lock-Based Enabling Technology for Container Cargo Transshipment Process**

**R&D Organisation** Hong Kong R&D Centre for Logistics and Supply Chain Management Enabling Technologies Limited

## Abstract

As Hong Kong is located in the centre of Asia and can offer ground shipping to China, port transshipment cargo movements contributed significantly to the port cargo growth of Hong Kong in recent years. During transshipment, security is necessary to make sure containers are sealed in custom and not tampered with. Containers that were locked with the e-lock equipped with GPS capability can be assumed as secure between the origin of transportation and the destination. Although international standard for e-locks, such as ISO 18185, has been defined in recent years; many functionalities for real-time tracking and monitoring are missing from these standards. As a result, vendors are producing proprietary e-lock systems to fulfill the needs of their customers and different types of e-lock and readers are available in the market which are not compatible with each other. Dedicated readers and software or platform are required for monitoring the respective e-locks. To tackle the above problems and facilitate a secured, streamlined and efficient transshipment process, LSCM R & D Centre propose a R & D project, extending on technologies developed by previous projects, to enable all stake holders to monitor transshipment containers effectively. With the help of e-lock based enabling technologies, the inspection sampling rate at the custom checkpoint can be reduced as the risk of the container being tampered is lowered, and hence increasing the operational efficiency.

**Project Coordinator** Mr Anthony Kwok



# 2010-2011 R&D PROJECTS

**Project Reference** ITP/037/09LP

**Project Title** Trust Solution for RFID Enabled Interoperable E-logistics

**R&D Organisation** The Hong Kong University of Science and Technology

## Abstract

Modern Logistics and Supply Chain Management (LSCM) has become increasingly open and interconnected. Building advanced e-logistics trading networks is essential for supporting the efficient and effective integration among vast numbers of logistic and supply chain enterprises. As the most important enabling technology, Radio Frequency Identification (RFID) has been widely used for bridging the gap between e-logistics and LSCM. Although adopting RFID significantly improves delivery and supply efficiency, security concerns, such as the cross-border authentication, ownership transfer, and security audits, etc., have not been well addressed due to the lack of consolidated trust solutions for capacity-limited RFID devices. First, there are many security barriers on the borders of the multi-domain e-logistics systems. Those barriers, although defending LSCM enterprises from being attacked, have become the major obstacles to constructing interoperable e-logistics systems. Second, heterogeneous nature of the LSCM infrastructure creates a challenging issue of enabling interoperability among diverse RFID-oriented security mechanisms. Third, the lack of effective measurements for establishing trust restrains inter-enterprise sharing and trustworthy collaboration. By addressing the problems, we propose an extensive trust solution to enhance the security and trustworthiness of RFID enabled interoperable e-logistics. In the project, we will develop the following critical technologies. 1) We will design core technologies for secure auditing along the entire e-logistics and LSCM chain. 2) We will develop a set of ownership transfer schemes for secure cargo exchange and circulation. 3) We will propose and implement an interoperable gateway to enable the interoperability among variant RFID-oriented security mechanisms. 4) We will develop key technologies for constructing a "trust center" in interoperable e-logistics and LSCM environments. This project has attracted strong support from major Hong Kong and mainland enterprises. Based on the research expertise of this project team, we shall contribute an integrated solution to improve trust in e-logistics and market the developed technologies to LSCM vendors and users.

**Project Coordinator** Dr Yunhao Liu



# 2010-2011 研发项目

项目编号 ITP/020/10LP

项目名称 **基于射频识别及感知器的工作场所生产力效率提升系统 (政府与企业)**  
研发单位 香港大学

## 项目简介

在由人操控的工作场所中，管理文件和资产等是必需的。然而，遗失资产仍时常发生，直接威胁管理效率。在惩教处及海关的案例中，一些重要对象是不可遗失的；在香港电台档案库的收藏，是无法替补的。未能及时追踪对象的后果，往往大于金钱损失。纵使 RFID 有助追踪物品，要实现个体层次上的追踪仍然困难。根本单靠 RFID 而未能感知业务环境的运作现况，是很难了解所发生的事故，及把事故与 workflow 联系起来。

这项目基于过往的 RAE 中间件，开发工作场所生产力提升系统 (HOPE 系统)，通过 RFID 和传感技术的集成应用，联系对象，管理人员与流程，提高对业务运作的追踪能力。该系统将增强工作场所运作效率及提升生产力，包括：1) 提高工作场所中物品—人员—流程 (AHP) 的交互可视，2) 开发智慧承载 (SAC) 系统，实现个体层次上的物品追踪，并提高效能，及 3) 改善可视性的基础技术，便利工作场所自动化。

项目统筹人 黄础章先生

项目编号 ITP/022/10LP

项目名称 **针对集装箱货物转运流程的电子关锁应用技术**  
研发单位 香港物流及供应链管理应用技术研发中心

## 项目简介

香港处于亚洲中央亦能陆路通中国，转口货品促进近年香港港口货品运量的增长。在转运过程中，须确保货柜在海关已上锁及没被非法干扰。拥有全球定位系统功能的电子锁确保货物从出发点目的地安全无误。虽然近年已订立如 ISO 18185 的国际电子锁标准，但仍缺乏实时追踪及监控功能的标准。因此各厂家生产自家电子锁系统以满足其用家，市场出现各类互不兼容的电子锁及阅读器。需使用专用的阅读器、软件或平台以监控电子锁。为解决以上的问题及提供更安全、精简及有效的转运流程，香港物流及供应链管理应用技术研发中心提出以过往项目为基础的研发项目，使业界能有效地监控货柜转运过程。使用电子锁为基础的应用技术能减低货柜受干扰的风险，因而降低海关口岸抽样检查的次数，从而提升运作效率。

项目统筹人 郭子正先生



# 2011-2012

## 2010-2011 研发项目

项目编号 ITP/037/09LP

项目名称 **支持基于射频识别技术的电子物流网络互联互通之可信解决方案**

研发单位 香港科技大学

### 项目简介

现代物流与供应链管理系统日益呈现开放与互联的趋势。为了符合这种发展，建设先进的电子物流贸易网络对在广大物流和供应链企业中实现高效的商业整合意义重大。作为最重要的支持技术，无线射频识别技术作为沟通与电子物流网络的桥梁已被广泛地应用在物流供应链管理中。虽然采用无线射频识别技术可以显着提高物流和供应链的配送供应效率，对安全的担心，如跨域认证，所有权转移和安全审计等问题，由于缺乏统一的基于射频识别技术的可信解决方案，尚未得到有效的解决。首先，在电子物流网络中各企业间存在许多安全壁垒。虽然这些壁垒可以为物流供应链管理系统抵御攻击，却成为电子物流网络中互联互通的主要障碍。其次，物流供应链系统的异构特性也是在不同的企业中支持电子物流网络中互联互通的主要阻碍。另外，缺乏信任的建立和管理机制也限制了物流及供应链企业间的信息共享和可信合作。为了解决这些问题，我们提出开发一套完整的支持基于射频识别技术的电子物流网络互联互通之可信解决方案。在这套方案中，我们计划开发以下的关键技术：1) 我们将设计复盖电子物流网络交易全程的安全审计核心技术；2) 我们将为货物的交换和流转开发一套所有权转移机制；3) 我们将提出一种可互操作的网关系统以支持不同射频识别安全技术的互联互通；4) 我们将为在互联互通的电子物流网络环境中建设可信中心开发关键技术。同时本项目得到了不同中国大陆和香港企业的大力支持。我们将在已获得的研究成果和经验基础上，为电子物流企业提供一整套可信解决方案，同时向主要的无线射频识别设备生产商和用户推广所研发的产品和技术。

项目统筹人 刘云浩博士