

**SME Development Fund (SDF)/
Dedicated Fund on Branding, Upgrading and Domestic Sales (BUD Fund)
(Organisation Support Programme) (OSP)**

Final Report on Approved Project

Project ref. no. : D16 001 010
Project title : **Promotional Program on Products Quick
Manufacturing and Functional Prototyping with
3D Printing**
Period covered : From 11 October 2016 to 10 February 2018
(dd/mm/yy) (dd/mm/yy)

1. Project Details

(Please mark with "*" if any of the following project details is different from that in the project proposal appended to the project agreement.)

Project Summary (in about 150 words)

This project is proposed to support the local SMEs to cope with the world leading industrial countries development trend and grasp the opportunities in 3D Printing. The program will also be a key step to drive re-industrialization in Hong Kong as 3D Printing process itself require much less space and procedures in processing compared with traditional process. It is quick and highly flexible production technology that shall further enhance Hong Kong industries' traditional strength and competitiveness in fast manufacturing and quick response to international customers.

This project includes an international conference, five 1-day seminars and an experience sharing symposium to promote 3D printing technologies for quick and direct manufacturing of end products and functional prototypes and its applications, the market opportunities, technological capabilities and cost effectiveness in 3D printing of value-added products and functional prototypes in different industry sectors such as tooling, medical devices, auto parts, high end consumer goods as well as aviation and power machinery parts to local SMEs, a video comprising clippings on various 3D printing methodologies for direct end products manufacturing and functional prototypes has been produced and disseminated to targeted local SMEs and the public, a project summary has been compiled into a booklet for distribution to local SMEs via the project applicant, HKPC and numbers of collaborating organizations under this industry-wide project. Video and electronic version of the booklet has been uploaded to project applicant's website for public access.

Project Objective(s) (in about 80 words)

- To support the local SMEs to cope with the world leading industrial countries development trend and grasp the opportunities in 3D Printing.
- To drive re-industrialization in Hong Kong as 3D Printing process itself require much less space and procedures in processing compared with traditional process;
- To enhance Hong Kong industries' traditional strength and competitiveness in fast manufacturing and quick response to international customers;
- To provide a quick reference to local SMEs on the latest 3D printing technologies and its applications and enhancing knowledge of manufacturers in appropriate 3D printing equipment selection.

Grantee/Collaborating Organisation/Implementation Agent

Grantee : Hong Kong Mould and Product Technology Association Limited
Federation of Hong Kong Industries
Hong Kong Auto Parts Industry Association Limited
Hong Kong Aviation Industry Association Limited
Hong Kong Foundry Association Limited
Hong Kong Medical and Healthcare Devices Industry Association Limited
Hong Kong Metals Manufacturers Association Limited
Hong Kong and Kowloon Plastic Merchants Association Limited
Hong Kong 3D Printing Association Limited
Collaborating Organisation(s) : Hong Kong 3D Printing Technology Association Limited
Implementation Agent(s) : Hong Kong Productivity Council

Key Personnel

	<u>Name</u>	<u>Company/Organisation</u>	<u>Tel No. & Fax No.</u>
Project Co-ordinator :	<u>Dr. Tommy Liu</u>	<u>Hong Kong Mould and Product Technology Association Ltd.</u>	<u>Tel: 2788 5786 Fax: 2788 5522</u>

Deputy Project
Co-ordinator

:

Mr. Alex Lau

Hong Kong Mould and Product
Technology Association Ltd.

Tel: 2788 5786
Fax: 2788 5522

Project Period

	<u>Commencement Date</u> (day/month/year)	<u>Completion Date</u> (day/month/year)	<u>Project Duration</u> (No. of months)
As stated in project agreement	<u>11 October 2016</u>	<u>10 October 2017</u>	<u>12 Months</u>
Revised (if applicable)	<u>11 October 2016</u>	<u>10 February 2018</u>	<u>16 Months</u>

2. Summary of Project Results

Project Deliverables

(Please list out the project deliverables as stated in the project proposal appended to the project agreement and provide details related to the actual result achieved for each of them.)

	Project deliverable	Quantifiable target number (e.g. 100 participants)	Actual result achieved (e.g. 90 participants)	Reasons for not achieving the target, if applicable (e.g. The total number of registered participants was over 120. However, some of them did not show up eventually. Will strengthen promotion and try to make up for the shortfall in the following two seminars.)
a)	To form a project steering committee and carry out the research and benchmarking study under the project.	1 committee	1 committee	
b)	Organise an International Conference on 3D Printing	1 conference	1 conference with 243 participants in total	
c)	Hold 5 Sector Specific Case Presentations Seminars on 3D printing of different types of value-added products and their functional prototypes.	5 seminars	5 half-day experience sharing seminars with 310 participants in total and 62 participants in average for each industry specific seminar	
d)	Produce a video on advanced 3D Printing	1 video	1 video of 37 minutes 52 seconds duration.	
e)	Organise an experience sharing symposium	1 symposium	1 symposium with 162 participants.	
f)	Compile a project report	1 report	1 report. 500 copies were printed and distributed.	

Details of the deliverables (e.g. date, duration, venue, speaker, topic discussed, etc.)

(Please list out in table format if necessary.)

- a) **To form a project steering committee and carry out the research and benchmarking study under the project.**

A project steering committee with 7 members was formed by the project applicant, collaborating organisations, HKPC and third-party experts.

- b) **Organise an International Conference on 3D Printing**

A full-day conference of more than 6 hours was held on 3 April 2017 to introduce 3D printing technologies by an expert from KEX, subsidiary of Fraunhofer Institute of Production Technology (IPT) from Germany together with 5 other overseas speakers to directors and middle management from local SMEs of different manufacturing, technology, creative and service industry sectors to provide a full picture of latest 3D printing technologies and market development.

Date: 3 April 2017

Duration: 09:30-12:30; 14:00-17:00

Venue: Conference Hall, 4/F, Hong Kong Productivity Council

Topics and speakers:

成品及功能性原型的 3D 打印國際會議

增材積層製造－最新技術及應用總覽

- Mr. Myron Graw, Partner of KEX Knowledge Exchange AG, Germany and Principal Facilitator of 3D Printing Consortium in Europe

由激光燒結、熔融與沈積技術帶來之金屬增材製造演進

- Dr.-Ing. Johannes Witzel, Fraunhofer Institute of Laser Technology, Germany

符合成本效益的金屬及陶瓷複合材料 3D 打印

- Dr. Sarig Nachum, Centre for High Temperature Materials and Design HTL, Fraunhofer ISC, Germany

利用積層製造之先進零部件生產應用

- Mr. Fred Fischer, Director, Stratasys – Applications, Products, Technology, USA

增材製造技術（工業級 3D 打印）如何助力工業 4.0

- Mr. Jack Wu, General Manager China, EOS GmbH, Germany

應用混合技術進行精密及高光 3D 金屬打印

- 香港生產力促進局智能製造及材料科技部顧問彭泓博士

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- c) Hold **5 Sector Specific Case Presentations Seminars** on 3D printing of different types of value-added products and their functional prototypes.

Five 1-day seminars of 6 hours or more per day were held in two phases. The first phase was held on 5 April 2017 and 6 April 2017. The second phase was held from 26 June 2017 to 28 June 2017. Each seminar includes a half-day session from an expert KEX, a subsidiary of Fraunhofer IPT of Germany introducing the findings on the consortium study on 3D printing in Europe concerning with detailed information and industrial cases on market opportunities, technological capabilities and cost effectiveness in adopting advanced 3D printing technologies in direct and quick manufacturing of 5 typical types of value added products and their functional prototypes including industrial tooling & robotics, medical implant and devices, auto parts, high end consumer and electronics products as well as aviation and power machinery parts respectively. At least 2 more speakers, one from overseas and one from Asia or Mainland China subsidiaries of overseas technology suppliers was invited to share further industrial cases under 5 sectors of value-added products industries mentioned above as well.

1. 模具3D 打印技術與實例研討會

Date: 5 April 2017

Duration: 09:30-12:30; 14:00-17:00

Venue: Hong Kong Productivity Council

Number of participants: 62

Topics and speakers:

3D 打印在模具工業的市場、技術及成本分析

- Dr. Myron Graw, Partner of KEX Knowledge Exchange AG (Subsidiary of IPT), Germany and Principal Facilitator of 3D Printing Consortium in Europe

模具 3D 打印及實例

- Dr. Sarig Nachum, Centre for High Temperature Materials & Design HTL, Fraunhofer ISC, Germany

金屬 3D 打印於模具應用新資訊

- Mr. Wu Huaian Adley, Key Account Manager Tooling, EOS GmbH, China (mother company in Germany)

FDM 技術的模具生產應用優勢、方案配套及最佳實踐

- Mr. Fred Fischer, Director, Stratasys – Applications, Products, Technology, USA

應用高精度 3D 打印機，快速製作產品原型及快速首辨模具

- 香港生產力促進局智能製造及材料科技部顧問彭泓博士

縱向 3D 打印技術：開發金屬粉材生產及激光拋光

- 香港生產力促進局智能製造及材料科技部顧問陳偉倫博士

2. 醫療及保健器材3D 打印技術與實例研討會

Date: 6 April 2017

Duration: 09:30-12:30; 14:00-17:00

Venue: Hong Kong Productivity Council

Number of participants: 64

Topics and speakers:

3D 打印在醫療工業的市場、技術及成本分析

- Dr. Myron Graw, Partner of KEX Knowledge Exchange AG (Subsidiary of IPT), Germany and Principal Facilitator of 3D Printing Consortium in Europe

熔融沉積和 PolyJet 技術和物料的醫療應用

- Mr. Jay Beversdorf, Senior Application Engineer, Stratasys

採用直接金屬雷射燒結的醫療和健康器材 3D 打印

- Mr. Jiaru Lu, Area Sales Manager, EOS GmbH, China

採用電子束金屬熔融 3D 打印技術的醫療及保健器材案例分析與成本效益

- Ms. Jane Chen, ARCAM China

醫學 3D 打印技術臨床應用實踐與思考

- 上海交通大學機械與動力工程學院王成燾教授

3. 汽車零部件 3D 打印技術與實例研討會

Date: 26 June 2017

Duration: 09:30-12:30; 14:00-17:00

Venue: Hong Kong Productivity Council

Number of participants: 63

Topics and speakers:

3D 打印在汽車工業的市場、技術及成本分析

- Mr. Myron Graw, Partner of KEX Knowledge Exchange AG, Germany and Principal Facilitator of 3D Printing Consortium in Europe

具效益的 3D 打印在混合動力汽車零部件的案例

- Mr. Zhang Yi, Vice President, Risemold Laser Technology (Shanghai), Partner of Sodick, Japan

積層生產研討

- Mr. Kevin Poon, Manufacturing Solutions Manager, Asia Pacific & Japan, Stratasys AP (mother company in USA)

增材製造解決方案在汽車行業的應用

- Mr. Koen Van de Perre, Sales Manager Medical Solutions, Materialise, Belgium

4. 航空與動力機械零部件 3D 打印技術與實例研討會

Date: 27 June 2017

Duration: 09:30-12:30; 14:00-17:00

Venue: Hong Kong Productivity Council

Number of participants: 61

Topics and speakers:

3D 打印在航空及能源工業的市場、技術及成本分析

- Mr. Myron Graw, Partner of KEX Knowledge Exchange AG, Germany and Principal Facilitator of 3D Printing Consortium in Europe

積層生產在航空及能源工業零部件的發展

- Mr. Frederik Klöckner, Technology Manager Additive Manufacturing, KEX Knowledge Exchange AG, Germany

具效益的 3D 打印在航空及能源工業零部件的案例

- Mr. Zhang Yi, Vice President, Risemold Laser Technology (Shanghai), Partner of Sodick, Japan

實現增材製造之設計事宜

- Mr. Koen Van de Perre, Manager, Materialise, Belgium

積層生產於航天業界之應用

- Mr. Kevin Poon, Manufacturing Solutions Manager, Asia Pacific & Japan, Stratasys AP (mother company in USA)

5. 高端消費品 3D 打印技術與實例研討會

Date: 28 June 2017

Duration: 09:30-12:30; 14:00-17:00

Venue: Hong Kong Productivity Council

Number of participants: 60

Topics and speakers:

3D 打印在消費產品的市場、技術及成本分析

- Mr. Myron Graw, Partner of KEX Knowledge Exchange AG, Germany and Principal Facilitator of 3D Printing Consortium in Europe

積層生產在高端消費產品的發展

- Mr. Frederik Klöckner, Technology Manager Additive Manufacturing, KEX Knowledge Exchange AG, Germany

珠寶首飾的工業 4.0 時代濃縮的智能生產模式：金屬 3D 打印

- Mr. River Cheung, Manager, Yuen Kee Ho Machinery, Technology Partner of Cookson gold, UK

3D 打印於電子消費產品之應用

- Mr. Kevin Poon, Manufacturing Solutions Manager, Asia Pacific & Japan, Stratasys AP (mother company in USA)

d) Produce a video on advanced 3D Printing

- Two versions of video with Cantonese and Mandarin voice over with Chinese and English subtitles have been produced.
- The video has been posted on website of HKMPTA for public viewing.

Duration: 37:51 minutes in total

Topics:

3D 打印技術應用

3D 打印技術 (main video on cross-sectorial technology and applications of 3D printing, more than 10 min)

- 1) 直接金屬雷射燒結 (DMLS)
- 2) 融合沉積模型 (FDM)
- 3) 選擇性燒結 (SLS)
- 4) 光造型術 (SLA)

Besides, the video also contains side tracks for case studies on applications of 3D printing under the following 5 value-added products sectors. Each side track video last for 5 minutes or above.

- 1) 模具及機械人
- 2) 醫療及外科植入器具
- 3) 汽車零部件
- 4) 高端消費品及電子產品
- 5) 航天及能源機械部件

e) Organise an experience sharing symposium

應用 3D 先進技術直接製造成品及功能樣品經驗綜合分享會

- A full-day experience sharing symposium of 6 hours was held on 9 February 2018 to introduce the real cases of local companies in adoption of advanced 3D printing for direct end products and functional prototypes manufacturing. There were 4 local speakers from pioneering companies adopting advanced 3D printing technologies making presentation with HKPC speaker on the event. Particulars are as below:

Date: 9 February 2018

Duration: 09:30 – 12:30; 14:00-17:00

Venue: Hong Kong Productivity Council

No of participants: 162

Topics and speakers:

應用直接金屬粉末燒結技術製造醫療產品個案

- 科能三維技術(醫療)有限公司丘榮豐先生

終端產品和功能原型 3D 打印經驗分享

- Manufacturing Solutions Manager, Asia Pacific & Japan, Stratasys AP, 潘家駿先生

全球最流行的 3D 打印技術應用分享

- 潤記號總經理鄧俊文先生

模流分析在 3D 打印精密模具的應用

- 電腦輔助成型技術交流協會唐兆璋先生
- 結合擴散焊接及先進金屬 3D 打印技術製造模具及精密零部件個案
- 香港生產力促進局智能製造及材料科技部主導顧問彭王博士

f) Compile a project report

A detailed project report titled “應用 3D 打印快速製造產品及功能樣板手冊” has been compiled and printed.

- This report covers various 3D printing manufacturing technologies suitable for tooling, medical devices, auto parts, high end consumer products, power equipment parts, aviation parts and other value-added products and parts flexible and small batch making, prototype makers and companies engaged in product design and development.
- It also comprises summary of speakers presentations on international conference, 5 seminars and experience sharing symposium. As some speakers only allow us to disclose part of the content in public, this report only covers information that speakers allow us to disclose.
- 500 copies of the report has been printed and distributed to trade associations, universities, vocational training bodies and public libraries. This report has been posted on website of HKMPTA for the public to download. Contents of the report are as below:

1. 適用於快速直接製造產品及功能樣板之3D 打印技術總結
2. 成品及功能性原型的3D 打印國際會議紀要
3. 模具3D 打印技術與實例研討會紀要
4. 醫療及保健器材3D 打印技術與實例研討會紀要
5. 汽車零部件3D 打印技術與實例研討會紀要
6. 航空與動力機械零部件3D 打印技術與實例研討會紀要
7. 高端消費品3D 打印技術與實例研討會紀要
8. 應用3D 先進技術直接製造成品及功能樣品經驗綜合分享會紀要

Milestones (in chronological order)

(# Please indicate if the milestone is completed (C), deferred (D) or not achieved (N). If it is deferred, please indicate the revised completion date. For those milestones which are deferred or not achieved, please also provide the reasons under item 2.4.)

<u>Milestone</u> (as set out in the approved project proposal appended to the project agreement)	<u>Original target completion date</u>	<u>Revised completion date</u> (if applicable)	<u>Status</u> (C/D/N) #
(a) To form a project steering committee and a 3D printing consortium	15/11/2016		C
(b) To organise a 1-day international conference on 3D Printing of end products and functional prototypes	30/04/2017		C
(c) To hold 5 full-day sector specific case presentations seminars on market opportunities, technological capabilities and cost effectiveness in 3D printing of different types of value-added products and their functional prototypes including but not limited to tooling & robotics, medical implant and devices, auto parts, high end consumer goods & electronics as well as aviation and power machinery parts.	30/06/2017		C
(d) To produce a 10 min integrated technology video and five 5-min sector specific side track clippings on advanced 3D Printing and upload to project applicant website and YouTube for public access	31/08/2017	31/12/2018	C
(e) To compile a project report, print 500 hardcopies and upload to project applicant website for public access	10/10/2017	10/02/2018	C

(f) To hold a 1-day experience sharing symposium for introducing the real cases of local companies in adoption of advanced 3D printing	10/10/2017	10/02/2018	C
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Future Plan for Promoting the Project Deliverables (Nil if not applicable)

The video on advanced 3D printing technologies as well as the project report are continuously uploaded to the website of the project applicant for public access after project completion till now and plan to post for at least 5 more months till 31 March 2019. The video was also uploaded to YouTube for public access.

Besides, video has been taken for the conference and experience sharing symposium under the project. The clippings authorized by speakers to shoot and disseminate was also uploaded to the website of project applicant and YouTube for public access till now. Project applicant will continue to post these video clippings at their website for at least 5 more months till 31 March 2019 as well.