

Prototype Production & Distribution Report

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1 INTRODUCTION

This report documents the production of 50 prototypes of Universe in a Box for distribution to partners from 30 countries. It follows the plan laid out in the Internship Report:

http://www.unawe.org/resources/reports/universe_box_jaya_report/

The boxes were produced by Curion Education Pvt. Ltd., an educational services provider, based in India and shipped from there.

1.1 ITEM SPECIFICATIONS

This section details the items present and their specification. Detailed descriptions follow in the next section.

Item	Specification	Units
Module 1,2,3: Moon, Earth, Sun		
Earth globe – 15 cm diameter, hollow metallic – 1 unit	15 cm diameter	1
Reusable adhesive – Blu Tac brand	10 cm x 1 cm strip	1
Small paper origami boat	Origami paper	1
Threaded bulb socket	Plastic	1
Light bulb	20 watts	1
Light bulb stand	Deodhar wooden base and PVC tubing	1
Styrofoam moon and wooden stick	3.75 cm diameter moon, 25 cm stick	1
Moon mask and Earth mask	Recyclable printed paper plates	2
Phases of the moon images	6 printed cards - 7 cm x 7 cm	1 set
Printed moon flip book	33 printed cards 10.5 cm x 5 cm	1 set
Module 2: The Planets		
2.5 m thick string	Nylon – 2.5 m long	1
Planetary system of wooden balls	10 cm, 8cm, 6.3 cm, 1.3 cm, 1.3 cm and .35 cm in Deodhar wood, 3.5 cm x 2 in Beach wood	1 set
Water colours - painting set – 1 unit	6 colours and 1 brush	1 set
Planet card game	8 printed cards: 10.5 cm x 6 cm	1 set
Images of the planets	9 printed images with hard lamination	1 set
Paper origami rocket	Origami paper	1
Module 3: The World of Constellations		
Zodiac band Roll	Printed card paper roll: 11.5 cm x 300 cm	1
Cardboard constellation projector and 28 T shaped paper cards	Printed card paper	1 set
Images of the Zodiac	Printed set of 12 A4 Images with soft lamination	1 set
Blue cloth	Cotton 1.5 m x 1.1 m	1
Printed Planisphere (Turnable star map)	Printed Card paper	1
Other		
Box File and 10 separator paper sheets	A 4 size	1 set

Item	Specification	Units
Big plastic box	Volume 23 Litre	1
Transparent Box Labelling Stickers – already stuck on the box – top and side	1 A3 size	1
Handbook	Printed A4 - 188 pages	1 set

1.2 ITEMWISE DESCRIPTIONS

This section details the descriptions of the items, whether they were sourced or developed, and comments on their production and considerations. Some of the developed items required printable materials that were provided in a Print Package.

Item	Development	Comments
Modules 1, 2, and 3: Earth-Moon-Sun		
Small globe (15 cm diameter)	Source	There are some standard sizes in globes. The 12 cm size although costs less is not big enough for clear demonstration. The 15 cm globe is required. A requirement for the globe is to check if the newest countries are marked out on them: East Timor (Timor-Leste, 2002), Montenegro (2006), Kosovo (2008), South Sudan (2011), and the borders of Morocco.
Reusable adhesive (10-12 cm in length)	Source	A big packet of 'Blue Tac' or a suitable alternative was purchased and individual strips added into the box. One strip is 10 to 12 cm long.
Small boat (about 4 cm wide)	Make	This was made out of origami paper. 2 boats from 1 paper; 25 papers
Light stand and bulb socket	Source / Make	This was fabricated from wood and PVC as stand of appropriate size was not available. The stand is 12 cm tall. Materials were chosen to keep the weight in check. A standard EU socket was provided. The cord was kept 2 m long for easy connection.
Light bulb	Source	A bulb of 20 W was used; the energy saving option was more expensive.
Styrofoam moon (3.75 cm) + wooden stick (25 cm)	Source	Styrofoam was used to make the moon. Balls of standard sizes are available. A 3.75 cm Moon ball is of relative size to a 15 cm Earth ball. Stick length.
Moon and Earth masks (17 cm to 19 cm)	Make –Print package 01	Two paper plates and printouts of the Moon the Earth on sticker papers (provided in print package) are needed. Secure holes were made on the sides to tie an elastic for the masks. A punch was used to punch out the eyes, nose and mouth.

Phases of the moon images	Make –Print package 02	Printed on glossy card paper (provided in print package). Three sets printed on one A4.
Moon Flip Book	Make –Print package 03	Printed on glossy card paper (provided in print package). One set printed on one A3.
Module 4: Planets		
Thick string	Source	2.5 m, bright yellow or red so it is easily visible
Planetary system of balls and Saturn's ring	Source / Make	Maple or beach wood. Mercury (3.5 mm), Venus, Earth (11 mm), Mars (6 mm), Jupiter (80 mm), Saturn (60 mm), Uranus, Neptune (35 mm), Sun (100 mm) Dimensions of Saturn's ring: Outer diameter: 11 cm; Inner diameter: 6.5 cm. Saturn's ring was cut out of a plastic sheet. A punch is needed for this cutout.
Painting set	Source	Tempera or acrylic paint set with 6 to 10 colours to paint the wooden balls with the details of the planet surface. A paint brush is also included in this standard set.
Planet card game	Make –Print package 04	Provided in print package. Print on A4 glossy card paper. Laminated for durability. Be careful for back and front print out coinciding.
Laminated pictures of the planets	Make –Print package 05	Provided in print package. Print on A3 glossy card paper. Laminated for durability. Punches needed for neat cutouts.
Origami rocket	Make	Made out of origami paper. 1 rocket in 1 paper; 50 papers
Module 5: Constellations		
Zodiac band	Make –Print package 06	Dimensions of the band: 11.5 *300 cm. Stickers to stick constellations on band provided in print package. The stickers have to be placed at equidistant locations. The dimension of the sticker is 11 cm * 11 cm. Ensure that the first sticker is placed at 14 cm. And there is 14 cm kept between each sticker.
Constellation projector and time cards	Make –Print package 07	The material used is cardboard and sticker. Use a punch to cut out the viewfinder base. Fold and stick the edges. Then pack the view finder entrance with a foam sheet with a circular eye hole. Punches used for the time cards, and holes.
Loose stars	Source	Inserted about 7 to 10 loose stars of different colours and sizes in one box. These were sourced from the Netherlands.

Images of the Zodiac	Make –Print package 08	Provided in print package. Normal colour print with soft lamination on A4 sheets.
Blue cloth	Source	Cloth bought in a roll of 75 into 1.5 m. 1.5 by 1.5 m pieces cut. Cut edges stitched for neatness.
Planisphere (Turnable star map)	Make –Print package 09	Provided in print package. Print on card paper. Punches needed for the need cut out.
Other		
File and separator paper for handbook	Source	File size suitable for A4 paper.
Big plastic box 23 L	Source	Durable box chosen.
Stickers	Make –Print package 10	One sticker for the top, the other sticker on the side printed on transparent sheet.
Handbook	Make –Print package 11	<p>Provided in print package. All colour prints. Some will be front-back and the others will be single. I have indicated this in the filenames. In the Appendix, some copies need to be made on transparency and others on card paper.</p> <p>1.CoverPage_SINGLE -- This will come at the front of the file 2.Introduction_SINGLE 3A.Module_1_Moon_SINGLE 3B.Module_1_Moon_BACKFRONT 4A.Module_2_Earth_SINGLE 4B.Module_2_Earth_BACKFRONT 5A.Module_3_the_sun_SINGLE 5B.Module_3_the_sun_BACKFRONT 6A.Module_4_Planets_SINGLE 6B.Module_4_Planets_BACKFRONT 7A.Module_5_Constelations_SINGLE 7B.Module_5_Constelations_BACKFRONT 8A.Appendix_SINGLE 8B.Appendix_SINGLE_ON-TRANSPARENCY 8C.Appendix_SINGLE 8D.Appendix_SINGLE_ON-CARDPAPER</p>

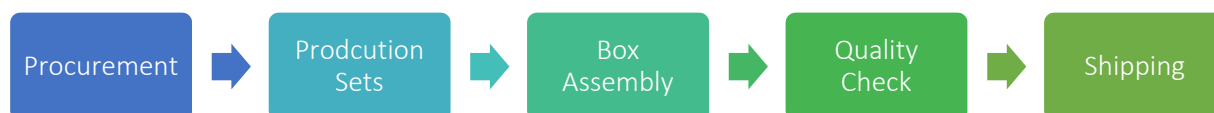
For neat cutouts, punches need to be made for the following:

- Moon and Earth mask
- Constellation Viewport, Time Cards (holes two needle sizes, one big, one small)
- Images of the planets

- Saturn ring
- Planisphere

2 PRODUCTION PIPELINE

Details of the production process for the 50 prototypes followed by Curion Education Pvt. Ltd. are given here. A total of 30 days were used to complete the process.



	#Persons	# Days / Hours	#Person Days
Procurement			
• Sourced Items	1	3.5 days	3.5
• Materials for Developed Items	1	3.5 days	3.5
Production sets			
• Printing	1	1 days	1
• Cutting	2	3 days	6
• Punching	1	3 days	3
• Finalizing	2	1 day	2
Box assembly			
• Sorting	2	1 day	2
• Inspection for quality	1	1 day	1
• Inserting	2	0.5 days	1
Quality check			
• Inspection for inventory	1	1 day	1
Shipping			
• Packaging	3	1 day	3
• Tracking	1	1 day	1
Total			28

3 SHIPPING & CUSTOMS

100 requests for prototypes were received from the website. Of these, 50 were shortlisted based on criteria for future involvement in production and distribution and educational input. Universe in a Box was shipped to 30 countries.

Status	Name	Organization	Country	Quantity	Shipper
Completed	Agnieszka Słowikowska	Kepler Institute of Astronomy	Poland	1	Aramex
Completed	Alessandra Zanazzi and Lara Albanese	INAF - Arcetri Astrophysical Observatory	Italy	1	Aramex

Completed	Amit Verma	Space Technology and Education Pvt. Ltd.	India	1	Shree Tirupati
Completed	Ángela Patricia Pérez Henao	Astronomy Kids Club	Colombia	1	Aramex
Completed	Avivah Yamani	langitselatan	Indonesia	1	Aramex
Completed	Carlos Cesar Apodaca	CREATE Astronomy & Robotics	USA	1	Aramex
Completed	Catalina Movileanu	Unawe Romania	Romania	1	Aramex
Completed	Cecilia Scorza	Haus der Astronomie	Germany	1	Aramex
Completed	Dorota and Jacek Kupras	EuHou Poland, www.djkupras.blogspot.com	Poland	1	Aramex
Completed	Dr. Gustavo Rojas	Universidade Federal de São Carlos	Brazil	1	Aramex
Completed	Dr. Rogel Mari Sese	Astrophysics Laboratory, Institute of Mathematical Sciences and Physics	Phillipines	1	Aramex
Completed	Edward Gomez	Las Cumbres Observatory	UK	1	Aramex
Completed	Eloi Arisa	Universitat Politècnica de Catalunya	Spain	1	Aramex
Completed	Eric Chisholm	UNAWE Canada	Canada	1	Aramex
Rerouted to NL	Ferenc Horvai	Nagy Károly Csillagászati Közhasznú Alapítvány (Astronomical Foundation)	Hungary	1	Aramex
Completed	Fermin Naelga, Jr.	Philippine Young Astronomers	Philippines	1	Aramex
Completed	Fikiswa Majola	Hartebeesthoek Radio Astronomy Observatory	South Africa	1	Aramex
Completed	Francisco Máximo Carvalho	Escola Portuguesa de Moçambique	Mozambique	1	Aramex
Completed	Hans Tuinenburg	Science Center NEMO	The Netherlands	1	Aramex
Completed	Hassane Darhmaoui	Al Akhawayn University in Ifrane	Morocco	1	Aramex
Completed	Hellen Tavora	South Florida Amateur Astronomers	USA	1	Aramex

		Association & Fox Observatory			
Completed	Ido B	Bareket observatory Israel	Israel	1	Aramex
Completed	Ivo Jokin	Municipal center for extracurricular activities	Bulgaria	1	Aramex
Completed	Jackie Slaviero	Eastwood Public School	Australia	1	Aramex
Completed	Jaya Ramchandani	Sirius Interactive	India	1	Personal Delivery
Completed	Kal Mannis	Navajo County Education Service Agency	USA	1	Aramex
Completed	Kevin Govender	IAU Office of Astronomy for Development	South Africa	1	Aramex
Completed	Lalrammawia	Mizoram science Centre	India	1	Aramex
Completed	Lekdim	Club Aster of Amateur Astronomers	Algeria	1	Aramex
Completed	Lewitt Somarajan	Teach for India	India	1	Shree Tirupati
Completed	Libby McKearney	Armagh Observatory	Northern Ireland	1	Aramex
Completed	Mani. M	Udhavum manasu	India	1	Shree Tirupati
Completed	Marina Pitts	The University of Western Australia	Australia	1	Aramex
Completed	Matthew McCool	Harris Elementary	USA	1	Aramex
Completed	Niaz Ashraf /Lores Blanes Linda	AnimAstro	Belgium	1	Aramex
Completed	Nouf Al-Jaloud	Prince Mohammad Bin Fahd University	Saudi Arabia	1	Aramex
Completed	Pedro Russo	Copex Air Cargo, Co/ Faculty of Sciences, Leiden University (Pedro Russo)	The Netherlands	2	Aramex
Completed	Pedro Russo	Copex Air Cargo, Co/ Faculty of Sciences, Leiden University (Pedro Russo)	The Netherlands	2	Speed Post India
Untraced	Pedro Russo	Copex Air Cargo, Co/ Faculty of Sciences, Leiden University (Pedro Russo)	The Netherlands	1	Speed Post India

Completed	Rodolfo Langhi	UNESP - Depto. Física	Brazil	1	Aramex
Completed	Rosa Doran	NUCLIO	Portugal	1	Aramex
Completed	Sævar Helgi Bragason	Stjörnufræðivefurinn	Iceland	1	Aramex
Completed	Sarah Abotsi-Masters	Ghana Astronomy and Observation Association / Ghana Planetarium	Ghana	1	Aramex
Completed	Soha Badry	Planetarium Science Center (PSC)	Egypt	1	Aramex
On Route	Mponda Malozo	UNAWA-Tanzania	Tanzania	1	Aramex
Completed	Thilina Heenatigala	UNAWA Sri Lanka	Sri Lanka	1	Aramex
Completed	Troshini Naidoo	South African Astronomical Observatory	South Africa	1	Aramex
Completed	Vasco Elói Duarte	Via Láctea Unipessoal Lda	Portugal	1	Aramex
On Route	Yunos Bakshi	C/O Christopher Phillips Astronomy Educator & Planetarium Professional	Afghanistan	1	

Aramex (<http://www.aramex.com/>) was selected as the shipping company based on competitive rates offered and reliability of the shipment reaching. Speed Post India proved to be an unreliable shipper. One box is yet to be traced. A local company Shree Tirupati was used for shipments within India.

A customs letter was added to the box. A revised letter was resent to four countries to explicitly state that Universe in a Box is an educational *gift* (Poland, Morocco, Italy, and Hungary) as they were requested to pay a customs fee. Two of these were not collected (Italy and Hungary) and are being rerouted to the EU-UNAWA International Office.

Two deliveries to Tanzania and Afghanistan are pending.

3.1 PRODUCTION COSTS

The below table lists the costs in the invoice and the actual costs.

Item	Listed Costs x50 (in INR)	Actual Costs x50 (in INR)	Actual Per Box Costs
Module 1: Earth-Moon-Sun System	10775	15760	315.2
Small globe	4500	8000	160.0
Reusable adhesive	500	500	10.0

Small boat	25	25	0.5
Bulb socket	1250	1250	25.0
Light bulb	750	750	15.0
Light stand	1500	2250	45.0
Styrofoam moon + wooden stick	75	135	2.7
Moon and Earth masks	400	800	16.0
Phases of the moon images	25	300	6.0
Moon Flip Book	1750	1750	35.0
Module 2: The Planets	15150	15150	303.0
2.5 m thick string	100	100	2.0
Planetary system of balls	9000	9000	180.0
Painting set	750	750	15.0
Planet card game	1500	1500	30.0
Laminated pictures of the planets	3750	3750	75.0
Origami rocket	50	50	1.0
Module 3: The World of Constellations	22075	24125	490.5
Zodiac band	2000	2000	40.0
Constellation projector (paper) and time cards	3250	3650	73.0
Loose stars	0	0	8.0
Images of the Zodiac	7500	7500	150.0
Blue cloth with stitching	8000	8400	168.0
Planisphere (Turnable star map)	1325	2575	51.5
Other	87500	65740	1445.2
File and separator paper for handbook	2500	2940	58.8
Big plastic box 23 L	15000	15000	300.0
Stickers, Handbook, Customs letter, Prototype survey letter (44 copies only)	0	47800	1086.4
Total Material Costs	135500	120775	2553.9
Production Cost and all misc costs	24000	29600	592.0
Professional Fees	7500	7500	150.0
Production Cost and Labour	15000	15000	300.0
Punch Costs	1500	7100	142.0
Total (INR)	89500	150375	3007.5
Total (1 EUR = 71 INR)	1261	2118	42.4

The differences were approved by the project manager.

- Small globe – Listed cost was for 12 cm globe. 15 cm globe requested.
- Light stand – Material costs were increased for better finish
- Styrofoam moon – Duplicate moons were made because initial set was of incorrect diameter
- Earth and Moon masks – Detailed cutting requested for better finish
- Phases of the moon images – Change in paper quality
- Constellation projector (paper) and time cards – Additional time cards for Southern Hemisphere added
- Blue cloth – Ends of the cloth needed stitching

- Planisphere (Turnable star map) – Produced for both Northern and Southern hemispheres
- Quality of file exchanged
- Stickers, Handbook, Customs letter, Prototype survey letter (44 copies only) – Not provided in initial quote
- Extra punches made to achieve better finish

3.2 SHIPPING COSTS

The shipping price list is given below.

Country	Region	INR
Egypt	Africa	2982
South Africa	Africa	3342
Algeria	Africa	4050
Ghana	Africa	4068
Mozambique	Africa	5262
Morocco	Africa	5922
Tanzania	Africa	5922
India	Asia	360
Indonesia	Asia	1650
Sri Lanka	Asia	2322
Saudi Arabia	Asia	2730
Philippines	Asia	4050
Israel	Asia	5268
The Netherlands	Europe	2826
Germany	Europe	3330
Poland	Europe	3330
UK	Europe	3330
Italy	Europe	3450
Spain	Europe	3510
Northern Ireland	Europe	3582
Belgium	Europe	4182
Hungary	Europe	4182
Romania	Europe	4530
Iceland	Europe	4650
Portugal	Europe	4782
Bulgaria	Europe	5982
Colombia	Latin America	5262
Brazil	Latin America	5910
USA	North America	3462
Canada	North America	3582
Australia	Oceania	2730

3.3 COST SUMMARY

The total costs are given below:

50 Prototypes (Invoices Raised) INR

Production and Development	92,974
Printing and Changes	49450
Total Costs	142,424
Shipping Costs	173,582
Batch 1	14,090
Batch 2	159,492
Total (INR)	316,006
Total (1 EUR = 71 INR)	4450.78873
Production + Shipping Per Box	EUR 90

3.4 ESTIMATED COSTS FOR SCALED UP PRODUCTION

For the production of 1000 boxes, a 40% reduction will be achieved, with a cost price of 1793 INR or 25 Euro per box (1 EUR = 71 INR).

Item	Actual Per Box Costs	Per Box Costs (1000 Boxes)
Module 1: Earth-Moon-Sun System	315.2	262.6
Small globe (15")	160.0	140
Reusable adhesive	10.0	8.5
Small boat	0.5	0.25
Bulb socket	25.0	20
Light bulb	15.0	13
Light stand	45.0	38
Styrofoam moon + wooden stick	2.7	1.35
Moon and Earth masks	16.0	9.5
Phases of the moon images	6.0	5
Moon Flip Book	35.0	27
Module 2: The Planets	303.0	222
2.5 m thick string	2.0	1.5
Planetary system of balls	180.0	150
Painting set	15.0	12
Planet card game	30.0	25
Laminated pictures of the planets	75.0	33
Origami rocket	1.0	0.5
Module 3: The World of Constellations	490.5	318
Zodiac band	40.0	35
Constellation projector (paper) and time cards	73.0	45
Loose stars	8.0	8
Images of the Zodiac	150.0	70
Blue cloth with stitching	168.0	125
Planisphere (Turnable star map)	51.5	35
Other	1445.2	530
File and separator paper for handbook	58.8	55

Big plastic box 23 L	300.0	245
Stickers, Handbook, Customs letter, Prototype survey letter (44 copies only)	1086.4	230
Total Material Costs	2553.9	1332.6
Production Cost and all misc costs	592.0	460
Professional Fees	150.0	200
Production Cost and Labour	300.0	250
Punch Costs	142.0	10
Total (INR)	3007.5	1792.6
Total (1 EUR = 71 INR)	42.4	25.2

4 KEY LEARNINGS

This section documents the key learnings for the production and distribution for 50 prototypes.

4.1 MATERIALS

The box was well received by the recipients. Some key points for improvement on the production:

- The attention to detail and finish of some items need to be improved
- The box was broken when shipped to some countries because of inadequate packing material
- Some items were missing from some boxes, example, the smallest planet mercury
- One stand was incomplete and another stand was broken
- The inside of the constellation projector should have been black and the holes should be needle sized (one size for smaller stars and one size for bigger stars)
- Constellation book was not shipped because it did not arrive in time

Next step: Detailed feedback on the materials needs is being collected and changes suggested. A thorough quality check procedure to be set in place. The producer should have one sample box with them before producing.

4.2 SHIPPING

The major problem with shipping was clearing the box from customs. The customs letter should explicitly state that the box is an educational gift. Another consideration for shipping is shipping by weight vs. shipping by volumetric weight. The weight of the box is 4 kg, but its volumetric weight based on the dimensions is 6 kg. Most shippers go by volumetric weight.

Next step: Look for area-focused shipping for better costs. Shipments for Europe could be sent to one address and then shipped from there for customs clearance.

4.3 FINANCIALS

Although the shipping costs were comparable to those in the report, a comparative analysis of shipping from the Netherlands would be useful. Handbook printing costs not compared and no quote was sought in NL. There has also been a delay in payment to the producers by the University, which put a few hiccups in the timeline.

Next step: Recipient to pay for shipment directly for ordered shipments. Solution for delay in payment through University needs to be sought.

4.4 OTHER CONSIDERATIONS

Sustainability, use of recyclable material like biodegradable plastic and recycled paper, and durability need to be considered.

Next step: Investigate financial viability of options