

### Project name

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Glia Foreign Office – 2020-2025

### Fellow(s)

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Tarek Loubani

### Short description

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The Foreign office has been established. Stable operational costs remain the most difficult item to gain funding for, and so we will continue funding the office's operational costs through the Shuttleworth Foundation grant with a plan to wean the office from the Foundation's grant funding.

### Objective(s)

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- Maintain the operational costs of the Glia foreign office so that it may continue its goal to research, create, maintain and manufacture high quality open access medical devices in the foreign country
- Permeate the broader values of local design and manufacture in the area
- Create a financially self-sufficient entity to ensure the continuation of the mission for open source medical devices

The Foreign team will:

- Be a centre of excellence for 3D printing and rapid prototyping
- Be a centre of excellence for Free/Open Source Software and Hardware in the Foreign country
- Disseminate 3D printing culture in schools, universities and businesses
- Produce medical devices for local hospitals and the Ministry of Health
- Train hospital biomedical engineering departments on use of 3D printing
- Establish centres for 3D printing and device development with willing partners as the opportunities arise



## **Link to scope of fellowship(s)**

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The fellowship scope is to both create medical devices and to create the conditions for open source medical devices to thrive. The Foreign country serves as a live test for these devices, and an office is necessary to coordinate this work.

## **Context**

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Over the past year, we have established an office in the Foreign region that has been more successful than we initially imagined. This project will allow the engineers in the Foreign office to continue their work full-time with Glia, and to have equipment that makes it possible to work efficiently and effectively.

There continues to be active work on addressing the medical device shortage in the Foreign region. However, other projects to address the medical device shortage due to the blockade focus on importing devices and designing political and legal mechanisms to ensure transit. These projects require large expenditures of political and financial capital, and so tend to be reserved for big-ticket items or times of extreme deprivation.

The unique geopolitical context also means that duplication is an essential component of any project, since any one location may be bombed at any time or the participants arrested or assassinated. A goal of the office will be to continue the creation of a network of printing and production centres over time.

## **Intended beneficiaries**

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- Ministry of Health (Foreign country) – creation of needed medical devices
- Work Without Borders (Foreign country) – continuing training and support of their 3D modeling team
- University College of Science and Technology (Khan Younis) – continuing training and support of biomedical devices division
- Terre des Hommes – continuing training and support of their mobile fablab
- Emaar Centre for Rehabilitation and Development – continuing training and support of their fablab
- Ministry of Health (Tunisia) – Our team will help in the creation of a fablab for Tunisia's Ministry of Health.



## Strategic partners

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- Ministry of Health (Foreign)
- Ministry of Health (Tunisia)
- University College of Science and Technology (Khan Younis)
- Terre des Hommes
- Emaar Centre for Rehabilitation and Development
- Tashkeel 3D
- Glia Inc

## Boundary players

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Boundary players are listed below in order of disruption as a function of ability and likelihood.

- Coordination of Government Activities in the Territories (COGAT) – Israeli unit responsible for blockade
  - Might deny project members entry to Gaza
  - Might deny equipment entry into Gaza
- Ministry of Interior (Israel)
  - Might deny project members visas to enter Israel
- Israel Security Agency (aka Shin Bet aka Shabak)
  - Might declare project members as terrorists
- Canadian Security Intelligence Service / Royal Canadian Mounted Police (CSIS/RCMP)
  - Might define work in Gaza as falling within Bill C51 (The Antiterrorism Act)
  - Might order confiscation of laptops / electronics
- Health Canada
  - Licensing barriers might create down-time in projects in Gaza



## **Methodology and activities**

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### **Manufacturing**

The Foreign office is presently co-located with Tashkeel 3D, a 3D printing, CNC and PCB-manufacturing facility currently based in a 3-room shared workshop. Glia will cover \$200 of the \$300 rent, and Tashkeel 3D will pay for the remainder. All of Tashkeel 3D's equipment (CNC, tools, etc) will be available to Glia. See below in "Sustainability strategy" for the rationale on keeping Tashkeel 3D alive.

### **Research and development**

Research and development was planned between the Glia office as well as the UCST-KY college, Al-Azhar University and the Islamic University of Gaza. To some extent, Glia has proven that private-sector research and development is possible and some engineering and manufacturing firms are considering entry into the field of medical devices.

As an independent group, Glia has been able to continue to perform research and development work on several of our devices and manufacturing technologies.

### **Personnel**

The office has four paid personnel, a medical lead (Dr. Mohammed Al-Attar) and three engineers (Mohammed Abu Matar, Shaker Shaheen and Mohammed Khdair). Because the office represents a real-life work opportunity, unpaid interns seconded from public universities will be leveraged as well.



## Outputs and deliverables

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### Medical device manufacturing

The primary task of the team will be to create and distribute medical devices. The long-term goal of the office from 2020-2025 will be to disseminate the culture and popularize the idea of indigenous medical device manufacturing. Short term annual goals will continue to be set depending on the need at that time. However, it is expected that by the end of this Pitch's period, Gaza will be independently manufacturing the tourniquet, stethoscope, otoscope, pulse oximeter, electrocardiogram and ClearMate carbon monoxide treatment device, as well as consumable and replacement parts.

The Glia group will continue to use a graded model of distribution and continuous improvement on all devices while encouraging other manufacturers in the sector to produce devices whose viability we prove.

### Quality control and assurance

During this period, Glia will shift into a quality assurance and control (QA/QC) role. The goal here is to encourage and foster high quality device creation by other players in the manufacturing sector. To prevent these players from creating a monopoly or oligopoly, Glia will continue to present a credible manufacturing threat to them by maintaining manufacturing capacity. However, our production will hopefully become a minority of the market and will serve to set quality and price standards rather than to compete with other products.

- Medical devices in Gaza:
  - Tourniquets (current)
  - Stethoscopes (current)
  - Pulse oximeters (expected)
  - Otoscope (expected)
  - Electrocardiogram (expected)
  - ClearMate Carbon Monoxide Treatment (expected)
- Train hospital biomedical engineering departments on use of 3D printing for replacement parts like gears
- Train personnel of new fablabs emerging in Gaza.



## Personnel development

Three engineers have been working extensively on 3D printing and its cultural dissemination in Gaza. They are Mohammed Abu Matar, Shaker Shaheen and Mohammed Khdair. Through this project, they will be given 1 day a week (5 day work week) to work on independent projects as they see fit to help them develop their skills and interests.

A physician with extensive administrative and field experience has been hired into the team and will continue to increase his role over the coming years.

## External training for 3D printing

Terre des Hommes is an international NGO with a centre in Gaza that is developing a mobile fablab. For this project to succeed, they will need 3D printers and other equipment, which our team will provide. As well, they will need training for their mobile team.

Emaar Centre for Rehabilitation and Development is in a similar position, looking for support for their fixed fablab in the southern region.

## Time frame

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Five years, non-renewable. Operating dates are March 1, 2020 to February 28, 2025.

## Resources and budget

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Table 1. Estimated annual capital costs

Item	Quantity	Unit cost	Total cost	Contributor
Solar system enlargement	1	2700	\$2,700.00	SF
Injection molding	1	500	\$500.00	SF
Safety equipment	1	150	\$150.00	SF
Total			\$3,350.00	



Table 2. Estimated annual material costs

Item	Description	Quantity	Unit cost	Total cost	Contributor
Plastic Pellets	Chi Mei Polylac PA-757 ABS	4	200	\$800.00	SF
Printer materials	Wood, paints, glue, etc.	1	100	\$100.00	SF
Project-related		1	500	\$500.00	GG
<b>Total</b>				<b>\$1,400.00</b>	

Table 3. Estimated annual monthly recurring costs

Item	Quantity	Monthly unit cost	Total annual cost	Contributor
Engineering salary	2	1000	\$24,000.00	SF
Support staff salary	1	1000	\$12,000.00	SF
Medical consultant salary	1	2000	\$24,000.00	GC
Maintenance	1	150	\$1,800.00	SF
Transportation	1	50	\$600.00	SF
Travel Expenses	1	140	\$1,680.00	SF
Travel Expenses	1	280	\$3,360.00	GG
Rent	1	200	\$2,400.00	SF
Accident insurance	1	33.33	\$400.00	SF
Accounts receivable payback	1	33.33	\$400.00	SF
<b>Total</b>			<b>\$70,640.00</b>	



Table 4. Estimated annual miscellaneous costs

Item	Quantity	Unit cost	Total cost	Contributor
Contingency fund	1	1250	\$1,250.00	SF
Contingency fund	1	625	\$625.00	GG
Contingency fund	1	625	\$625.00	GC
Medical Conference / Hackathon	1	600	\$600.00	SF
Medical Conference / Hackathon	1	300	\$300.00	GG
Other	1	620	\$620.00	SF
<b>Total</b>			<b>\$4,020.00</b>	

Table 5. Total costs for FY2020

Capital costs	\$3,350.00
Material costs	\$1,400.00
Monthly recurring costs	\$70,640.00
Miscellaneous Costs	\$4,020.00
<b>Total</b>	<b>\$79,410.00</b>

Table 6. Organizational contributions for FY2020

Organization	Amount	Percent
Glia Gaza	\$4,785.00	6.03%
Glia Canada	\$24,625.00	31.01%
Shuttleworth Foundation	\$50,000.00	62.96%
<b>Total</b>	<b>\$79,410.00</b>	<b>100.00%</b>





Table 7. Organizational contributions for FY2020-2021

<b>Fiscal Year</b>	<b>Shuttleworth Foundation</b>	<b>Glia Gaza</b>	<b>Glia Canada</b>
2020	\$50,000.00	\$4,785.00	\$24,625.00
2021	\$40,000.00	\$14,785.00	\$24,625.00
2022	\$30,000.00	\$24,785.00	\$24,625.00
2023	\$20,000.00	\$34,785.00	\$24,625.00
2024	\$10,000.00	\$44,785.00	\$24,625.00
2025	\$0.00	\$54,785.00	\$24,625.00
<b>Total</b>	<b>\$150,000.00</b>	<b>\$178,710.00</b>	<b>\$147,750.00</b>

## Measures of success

### What changes in behaviour do you expect to see?

1. Independence of the engineers in Gaza to create, research and manufacture devices
2. Ability of TdH, Emaar, UCST-KY and WWB to 3D print with competence
3. The maturation of an indigenous medical devices R&D and manufacturing sector

### What changes in behaviour would you like to see?

We have gained some hardcore credibility through our ability to be on the field and in the academic ivory tower. However, people have looked curiously at us, rather than jumping in. After a year of visible successes, we hope others will be convinced that the use of open source works and that what we are doing is possible.

### What changes in behaviour would you love to see?

Complete independence and collaboration between all teams.



## Communication strategy

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Intra-group communication will be done using Mattermost, Kanboard, email and in-person meetings.

External communication will be via twitter, facebook, instagram and public talks in Gaza and internationally.

## Sustainability strategy

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Sustainability of this project will depend on three main strategies.

For our partners, the innate advantage of cooperating in the project will hopefully be worth contributions from both via future grants or internal funding pools.

For the development component, we will continue to apply for and obtain academic grant funding, hopefully even a major grant via the Canadian science research system (Natural Sciences and Engineering Research Council, NSERC; or Canadian Institutes of Health Research, CIHR).

The third strategy is to attempt to create a high-impact revenue stream by transferring some legitimacy and capability from this project to Tashkeel 3D, which should be in a position to take over Glia's funding needs by using commercial contracts to fund the office after the completion of the granting period.

## Risks

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The main risks for this office and its personnel are:

1. Personnel gaining status and taking higher paid jobs elsewhere
2. Personnel being targeted by Israeli authorities for perceived anti-Israeli activities
3. Personnel being targeted by Palestinian authorities for perceived anti-Palestinian activities
4. Theft, confiscation or destruction of office and equipment by Israeli or Palestinian forces
5. Theft of equipment by domestic competitors or idiots
6. Engagement of office personnel in non-medical activities of 3D printing, such as commercial or military uses.