INTELLIGENT DYNAMIC SCHEDULING & PLACEMENT SYSTEM TO FACILITATE GRAVE EXHUMATION & REINTERMENT

CONTEXT

Wareesan Management Pte Ltd (herein referred to as "Wareesan") is a subsidiary of Warees Investment Pte Ltd, a wholly owned subsidiary of Islamic Religious Council of Singapore (herein referred to as "Muis").

Wareesan play an integral role to ensure sufficient land for future Muslim burials and oversee the registration, exhumation and reinternment of Muslim graves at Choa Chu Kang Muslim Cemetery.

Due to the land scarcity in Singapore, a burial policy was put in place in 1998 by the National Environment Agency (NEA) to limit the lease of graves to 15 years. The exhumation and reinternment of graves ensure sufficient space for future burials while providing a new resting place for the deceased.

In 2007, Crypt Burial System (CBS) was introduced – an improved version of the traditional soil burial system in Singapore. A CBS burial plot consists of a concrete crypt without a base. The deceased are buried in these crypts, which are laid out in grids to allow for more efficient land use.

An estimated 35,000 graves are expected to be exhumed in phases from 2017 to 2021 in the current exercise. Moving forward, more graves are will be exhumed and reinterred as when leases of 15 years are up.

The exhumation and reinternment process from start to finish are time intensive and rely heavily on manual labor. The family members have to contend with long waiting time coupled with somber emotional state, challenging terrain at grave site and possible changes to exhumation date to last minute rescheduling by the claimants and their family members. Therefore, touch points to the bereaved family can be both unpleasant and uncomfortable.

Wareesan needs to be sensitive in such situation and will like to provide as frictionless as possible exhumation and reinternment process for the family members or next-of-kin.

The exhumation / reinterment process consists of these key stages:

1. **Registration by claimants & scheduling**:

   Next-of-kin (NOK) are invited to claim the remains of their beloved one from the designated blocks (Principal Blocks) that has been identified to be exhumed called the "Principal Grave". NOK is also being given the opportunity to claim the other late family members buried from non-principal block (called Supplementary Grave") with the condition that both deceased must

be related in terms of the family nucleus and the minimum burial period so that the deceased from the same family can be reinterred in the same crypt. Balance graves not claimed are considered unclaimed, which will be exhumed and reinterned only after claimed phase has completed. Scheduling for exhumation is done on a first come first serve basis and there are no specific graves allocated to which days or months. Therefore, the actual exhumation of graves may not be done be in a specific sector, cluster or rows manner instead its rather quite sporadic. Rescheduling of exhumation date can be very challenging to accommodate as administratively it can cause disruption to the operation fulfilling the minimum needed number of exhumations contracted with the contractor and reburial per day.

2. **Verification of Graves**:

Verification is the second step to the exhumation process. It must be done immediately on the same day after NOK has made the registration in the office. This process ascertained that the graves existed on site. Should there be discrepancy between site with records and the case cannot be resolved, then case has to be rescheduled, sometimes more than one time. Other situation that can pose to be challenging are environmental conditions such as non-existent tracks, sloping terrain, weather and family disputes.

3. **Exhumation of Graves, Shrouding & Reinterment**:

These processes must be completed on the same day, and family members are invited to witness the entire process. Typically, 40 graves are exhumed and reinterred within a workday. Unpredictable weather can postpone exhumation works and reschedule date may not be available the earliest. Multiple families can/may share the crypt in order to maximize capacity.

It's high time to give due thought process if the solution for the system to have the capability to be able to do smart scheduling taking into consideration to all the challenging circumstances in phases.

PROBLEM STATEMENT

How might we create a dynamic yet able to meet time specific needs with automated exhumation scheduling and reinterment placement process of graves?

WHAT ARE WE LOOKING FOR

A prototype scheduling and placement (reburial) system that considers key data points and human inputs throughout the entire process of registration, verification, exhumation and reinternment. This system must take into account factors such as, but not limited to, grave location, identification, weather and terrain conditions, and scheduling changes.

There are no restrictions on the geographic location of the problem solvers who may choose to apply to this challenge. However, the prototype needs to be demonstrated in Singapore.

POSSIBLE USE CASE

The solution dynamically proposes and updates exhumation schedule to accommodate a variety of factors which can affect claimant waiting time.

- The system considers terrain conditions of the graves verification and exhumation effort (as in some areas, the soils can be very hard while others can be a slope) This can enable planners to schedule more time where needed, or to exhume graves from different plots (to achieve the target of 40 exhumations per day).
- The system considers the location of verified graves (scheduled from outer to inner graves), coupled with the terrain conditions and proposes an optimal exhumation period to choose from for approval and acceptance. This ensure the graves undergoing exhumation are closely or within the same sector cluster thus creating a productive exhumation schedule while meeting the needed placement within CBS. The location of the grave should be marked (geotraceability) and should allow claimants to revisit the grave site easily on the day of exhumation to avoid delays in the process. (Any physical tagging of the grave and tombstones should be weatherproof)
- The system dynamically updates the schedule in response to any scheduling changes, such as:
  - no-shows, showing up without prior appointments, or late claim registration (outside of claim period)
  - Last minute changes in the placement of remains in crypts, but still filling each crypt with 8 sets of remains
- The system notifies claimants and Wareesan of changes in schedule determined by the system automatically by way of mobile devices.

WHAT'S IN IT FOR YOU

- SGD 35,000 of prize money for each winner of this challenge (see Award Model)
- Opportunity to test in Singapore and scale regionally or globally

EVALUATION CRITERIA

The solutions will be evaluated based on the criteria below:

Solution Fit	To what extent does the proposed solution address the problem statement effectively?
Solution Readiness	How ready is the proposed solution to go to the market? Is there any evidence to suggest capacity to scale?
Solution Advantage	If the solution is truly innovative, does it make use of new technologies in the market, and can it potentially generate new IP?
Company Profile	Does the product have user and revenue traction? Do the team members possess strong scientific/technical background?

AWARD MODEL

30% of the prize money will be awarded to each selected finalist at the start of the prototype development process, with the remainder 70% to be awarded during the prototype development process, based on milestones agreed between Wareesan Management Pte Ltd

Note that a finalist who is selected to undertake the prototype development process will be required to enter into an agreement with between Wareesan Management Pte Ltd that will include more detailed conditions pertaining to the prototype development.

DEADLINE

All submissions must be received by **5 June 2020, 1600 hours (SGT/GMT +8).** Wareesan Management Pte Ltd and IMDA may extend the period of the submission at their discretion. Late submissions are disqualified.

FORUM

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