


**Final Report**

# Future-Proofing Shaw Theatres:

# Strategic Responses to the 2025 Cinema Closures

# in Singapore

Lee Hao Rong Javier

# Table of Content


| | |
|---|---|
| Abstract | 2 |
| Problem | 2 |
| Frequentist Design and Hypothesis Specifications | 3 |
| Significance and feasibility of Geospatial Analysis | 3 |
| Data Description | 7 |
| Data Feasibility Assessment and Evaluation | 9 |
| Feasible solutions | 9 |
| Action 1: Shaw closes one existing cinema | 9 |
| Action 2: Shaw opens one more cinema | 11 |
| Evaluation of Action 2 | 36 |
| Action 3: Shaw maintains status quo | 38 |
| Action 4: Shaw decides to open more than 1 cinema | 40 |
| Action 5: Shaw decides to open the cinema that hurts Golden Village the most | 40 |
| Trade-offs and Evaluation | 41 |
| Conclusion | 42 |
| References | 43 |
| Appendix | 44 |

# Abstract

Shaw Theatres operates within Singapore's highly competitive cinema market, alongside Golden Village and Cathay Cineplexes. With Cathay Cineplexes and The Projector ceasing operations and closing all outlets (Goh et al., 2025; Lui, 2025), Shaw Theatres faces a critical decision. They can either choose to open a new cinema, close a cinema or maintain the current status quo. We aim to guide Shaw's long term strategy through the use of geospatial data such as competitor cinema locations, urban development, population dynamics, transport and accessibility.

# Problem

Singapore cinema attendance fell from 18.46 m (2019) to 8.4 m (2024), a 54.5% drop. (Singapore Department of Statistics, 2025) With Cathay Cineplexes and The Projector ceasing operations and closing all outlets August 2025 (Goh et al., 2025; Lui, 2025), and Golden Village remaining as the largest exhibitor with 16 multiplexes and 122 screens, (Golden Village Multiplex Pte Ltd., 2025), Shaw Theatres faces a strategic coverage gap. If Shaw Theatre does not act, Golden Village can pre-emptively expand into Cathay's vacated catchments and lock in long-run audience share.

With Cathay Cineplexes abruptly exiting the Singaporean Cinema Market, screens and multiplexes from mature suburban nodes once owned by Cathay, including Woodlands and Clementi, are shut down. Such closures remove footfall to heavily visited malls with direct MRT access and remaining competitors in the market can cash in on these empty zones.
Even at lower baselines, the survivor that re-anchors in ex-Cathay catchments captures recurring footfall from malls. As much as we are advising Shaw Theatres on the next best decision to take, delays in Shaw's plans to open in at least one new cinema with a high geographic share may allow Golden Village to enter first to capture lapsed patrons, and increase local share and pricing power, further raising Shaw's long-run customer acquisition costs and lowering network-wide occupancy. Further, given Golden Village's geographic share of 61.4% of the entire market and them owning more cinema multiplexes than Shaw, inaction cedes Cathay's geographic share to Golden Village at minimal incremental cost to them.

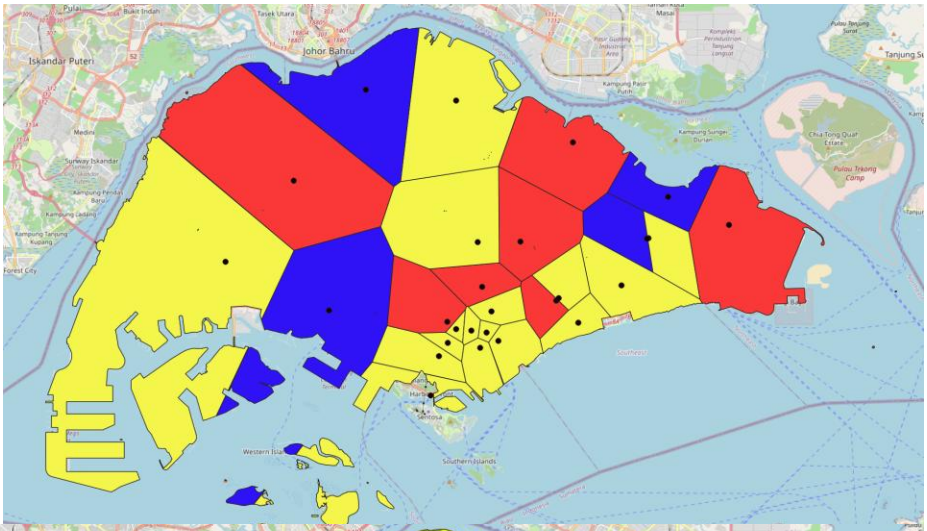



*Figure 1: Geographic Share of all Cinemas in Singapore by company prior to Cathay's closure through a Voronoi Diagram*

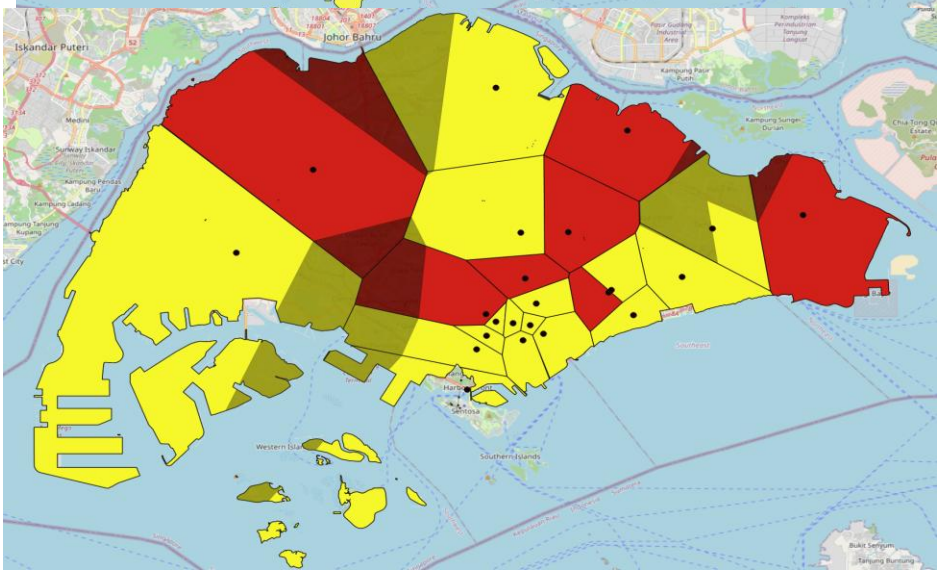



*Figure 2: Final Geographic Share of all Cinemas in Singapore by company after Cathay's closure through a Voronoi Diagram, with Shadowed areas showing geographic share that is collected by survivors of the Singaporean Cinema Market.*

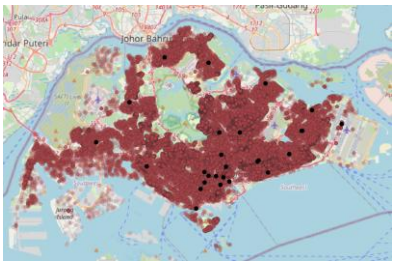
| **Company** | **Geographic Footprint before Aug 2025** | **Geographic Footprint After Aug 2025** |
|---|---|---|
| Golden Village | 49.3% | 61.4% |
| Shaw Theatres | 31.8% | 38.6% |
| Cathay Cineplexes | 18.9% | - |

# Frequentist Design and Hypothesis Specifications

We set the Type I error rate, $\alpha = 0.05$, and Type II error rate, $\beta = 0.20$. This gives a 5% probability of falsely rejecting a true null hypothesis and a 20% probability of failing to reject a false one, corresponding to 80% power (80% chance of correctly rejecting a false null hypothesis).

# Significance and feasibility of Geospatial Analysis

Geospatial analysis enables the systematic examination of spatial relationships and patterns between existing cinema locations and their surrounding urban context. We check whether **first-order effects** and **second-order effects** are statistically significant and practically significant to justify that geospatial analysis is a feasible take for recommending Shaw Theatres what to do next.





*Figures 3 (left) and 4 (right): Dot Map showing cinema locations relative to postal code (left) and bus stops (right)*

Building on these visual insights, we identified three key covariates that are likely to exert first-order effects on cinema placement: Population Density, Real Estate Transaction Price, and Transport Density. We felt that these covariates are important components for subsequent spatial modelling and analysis as they capture fundamental drivers of footfall, accessibility, and market attractiveness respectively.

Null Hypothesis $H_0$: Cinema point pattern follows Complete Spatial Randomness, and arises from a homogeneous Poisson process with constant intensity.
Alternate Hypothesis $H_1$: Cinema point pattern does not follow Complete Spatial Randomness, and population density does interact with the spatial distribution of cinemas.

Using **population density** as the covariate, the first-order spatial effects for cinema locations are **statistically significant** (0.00572<0.05), based on the likelihood ratio test comparing a model with complete spatial randomness to a model that includes population density as a covariate. We have sufficient evidence at $\alpha = 0.05$ to reject the null hypothesis. Further, the first-order spatial effects for cinema locations are **practically significant**. The likelihood ratio effect size (Cohen's w) for population density is 0.696 > 0.50 (which suggests a large effect according to Cohen's guideline). This suggests that the effect is detectable statistically and substantial enough to be meaningful. The combination of statistical significance and practical significance implies that population density should be considered a key covariate in spatial planning and resource allocation for cinema infrastructure.

```
--- Likelihood-ratio test (m0 vs m2) ---
> print(anova(m0, m2, test = "LR"))
Analysis of Deviance Table

Model 1: ~1      Poisson
Model 2: ~pop    Poisson
  Npar Df Deviance Pr(>Chi)
1    1
2    2  1   2.9529  0.00572 .
```

*Figure 5: Likelihood Ratio Test for Population Density*

Null Hypothesis $H_0$: Cinema point pattern follows Complete Spatial Randomness, and arises from a homogeneous Poisson process with constant intensity.
Alternate Hypothesis $H_1$: Cinema point pattern does not follow Complete Spatial Randomness, and the price of real estate does interact with the spatial distribution of cinemas.

Using the **price of real estate** as the covariate, the first-order spatial effects for cinema locations are **statistically significant** (0.004<0.05), based on the likelihood ratio test comparing a model with complete spatial randomness to a model that includes the price of real estate as a covariate. We have sufficient evidence at $\alpha = 0.05$ to reject the null hypothesis. Further, the first-order spatial effects for cinema locations are **practically significant**. The likelihood ratio effect size (Cohen's w) for price of real estate is 0.661 > 0.50 (which suggests a large effect according to Cohen's guideline). This suggests that the effect is detectable statistically and substantial enough to be meaningful. The combination of statistical significance and practical significance implies that price of real estate should be considered a key covariate in spatial planning and resource allocation for cinema infrastructure.

```
--- Likelihood-ratio test (m0 vs m3) ---
> print(anova(m0, m3, test = "LR"))
Analysis of Deviance Table

Model 1: ~1      Poisson
Model 2: ~price          Poisson
  Npar Df Deviance Pr(>Chi)
1    1
2    2  1   2.8045    0.004 .
```

*Figure 6: Likelihood Ratio Test for Real Estate Transaction Price*

Null Hypothesis $H_0$: Cinema point pattern follows Complete Spatial Randomness, and arises from a homogeneous Poisson process with constant intensity.
Alternate Hypothesis $H_1$: Cinema point pattern does not follow Complete Spatial Randomness, and bus transport density does interact with the spatial distribution of cinemas.

Using **bus transport density** as the covariate, the first-order spatial effects for cinema locations are **statistically significant** (0.0032<0.05), based on the likelihood ratio test comparing a model with complete spatial randomness to a model that includes bus transport density as a covariate. We have sufficient evidence at $\alpha = 0.05$ to reject the null hypothesis. However, the first-order spatial effects for cinema locations have **limited practical significance**. The

likelihood ratio effect size (Cohen's w) for bus transport density is 0.133 < 0.50 (which suggests a large effect according to Cohen's guideline). Combined with the low statistical power of the test, this indicates that only small effects are detectable and the observed association may not be substantial.

```
--- Likelihood-ratio test (m0 vs m4)
> print(anova(m0, m4, test = "LR"))
Analysis of Deviance Table

Model 1: ~1      Poisson
Model 2: ~tran   Poisson
  Npar Df Deviance Pr(>Chi)
1    1
2    2  1  0.56262   0.0032
```

*Figure 7: Likelihood Ratio Test for Bus Transport Density*




*Figure 8: Dot Map showing cinema locations relative to shopping malls*



*Figure 9: Dot Map showing cinema locations relative to bus stops with high tap-ins/tap-outs for buses*

We identified covariates such as shopping malls that are likely to exert second-order effects on cinema placement.

Null Hypothesis $H_0$: Cinema point pattern follows Complete Spatial Randomness, and arises from a homogeneous Poisson process with constant intensity.

Alternate Hypothesis $H_1$: Cinema point pattern does not follow Complete Spatial Randomness, and shopping mall placement does interact with the spatial distribution of cinemas.

Montecarlo K-function envelope was used to compare observed spatial correlations against random expectations. The test for mall proximity yields *p=0.0036*,which is well below the standard significance threshold of *α=0.05*.

```
Shopping Malls:
  Observed Correlation: 0.9372
  P-value: 0.0036 ** VERY SIGNIFICANT
  Interpretation: Shopping malls DO significantly predict performance
```

*Figure 10: Monte Carlo K Envelope Function Result for Mall Proximity p-value*

This allows rejection of the null hypothesis with high confidence, confirming that the observed clustering of theatres near malls is unlikely to arise by chance alone. Such a statistically

significant result reinforces the importance of mall proximity as a covariate in geospatial modeling and supports the use of spatial analytics for optimizing future site recommendations.

# Data Description

| No | Dataset Description | Geometry Type |
|---|---|---|
| 1 | Subzone Boundary<br>Name - identifier of the feature<br>Description - contains an HTML table with all attributes below:<br>SUBZONE_NO - numerical subzone identifier<br>SUBZONE_N - subzone name (e.g., DEPOT ROAD, CHINATOWN)<br>SUBZONE_C - subzone code (e.g., BMSZ12, OTSZ03)<br>CA_IND - conservation area indicator (Y/N)<br>PLN_AREA_N - planning area name (e.g., BUKIT MERAH, OUTRAM)<br>PLN_AREA_C - planning area code (e.g., BM, OT)<br>REGION_N - region name (e.g., CENTRAL REGION)<br>REGION_C - region code (e.g., CR).<br>INC_CRC - checksum or integrity code (hexadecimal string)<br>FMEL_UPD_D - update date/time stamp (e.g., 20191223152313)<br>Coordinates - arrays of longitude, latitude, and altitude values | geojson |
| 2 | HDB Coordinates<br>Name - identifier of the feature<br>Description - contains an HTML table with all attributes below:<br>ENTITYID - numerical HDB identifier<br>POSTAL_COD - postal code<br>INC_CRC - checksum or integrity code (hexadecimal string)<br>FMEL_UPD_D - update date/time stamp (e.g., 20191223152313)<br>Coordinates - arrays of longitude, latitude, and altitude values | csv |
| 3 | LTA/MRT Station Exits<br>Name - identifier of the feature<br>Description - contains an HTML table with all attributes below:<br>STATION_NA - Station Name<br>EXIT_CODE - Exit Code (eg. Exit B)<br>INC_CRC - checksum or integrity code (hexadecimal string)<br>Coordinates - arrays of longitude, latitude, and altitude values | geojson |
| 4 | Electoral Boundary 2025<br>FID - Numeric feature identifier<br>ED_DESC - Truncated name of boundary<br>ED_DESC_FU - Full name of boundary<br>Name - Truncated name of boundary<br>NEW_ED - Boundary Code<br>Coordinates - arrays of longitude, latitude, and altitude values | geojson |

| | | |
|---|---|---|
| 5 | Singapore Population Count<br>Raster of Population Density | gpkg |
| 6 | Singapore Administrative Areas<br>OBJECTID - Index of Nation<br>ID_0 - Numeric identifier of Nation<br>ISO - International Nation Code<br>NAME_0 - Name of Nation<br>VALIDFR - Date when data was first collected<br>VALIDTO - Date when data was last collected<br>POP2000 - Population Count<br>SQKM - Area of Nation<br>POPSQKM - Population Count per SqKM | csv |
| 7 | Dynamic Bus Stops<br>BusStopCode - Bus Stop Code<br>RoadName - Road Name<br>Description - Description of location<br>Latitude, Longitude - Latitude, Longtitude | csv |
| 8 | Singapore Train Station Coordinates<br>Station_name - Name of Station<br>Type - Indicates LRT/MRT<br>Lat - Latitude<br>Lng - Longtitude | csv |
| 9 | Singapore Train Station Coordinates 2<br>OBJECTID - Index of station<br>STN_NAME - Station Name<br>Geometry - Latitude, Longitude<br>Latitude - Latitude<br>Longtitude - Longtitude | csv |
| 10 | Singapore Postal Code to Latitude and Longitude<br>Postal Code<br>Address<br>Block Number<br>Building Name<br>Longitude,Latitude | csv |
| 11 | Singapore Resale Flat Prices<br>Month<br>Town<br>Flat Type<br>Block Number<br>Street Name<br>Storey Range<br>Floor Area Sqm<br>Flat Model<br>Lease Commence Date<br>Remaining Lease | csv |

| | | |
|---|---|---|
| | Resale Price | |

# Data Feasibility Assessment and Evaluation

Scenario and counterfactual testing is possible and feasible firstly due to the abundance of high resolution, attribute-rich geospatial datasets as well as granular national subzone mappings. This allows us to do spatial modelling and geospatial analysis. Further, these datasets are routinely updated, actively maintained and this allows our insights to be accurate and reliable. Last but not least, tooling is mature, production-ready, open source and mainly free. Thus, with these points, a geospatial recommendation and workflow is both practicable, reproducible and auditable.

# Feasible solutions

In response to Cathay Cineplexes ceasing operations, Shaw Theatres can choose to either close one of their existing cinemas, open one more cinema, or do nothing.

# Action 1: Shaw closes one existing cinema

**Area Analysis**

| | Before | After removing Lot One | After removing Jewel | After removing Waterway Point | After removing LIDO | After removing Nex | After removing Balestier | After removing Paya Lebar |
|---|---|---|---|---|---|---|---|---|
| Golden Village | 61.40% | 77.89% | 68.42% | 64.52% | 65.02% | 64.11% | 62.41% | 62.29% |
| Shaw Theatres | 38.60% | 22.11% | 31.58% | 35.48% | 34.98% | 35.89% | 37.59% | 37.71% |
| Geographic Share lost | | 43.62% | 18.19% | 13.09% | 10.40% | 9.05% | 3.35% | 2.32% |

*Table 1: Consequences of Shaw Theatres closing down one of its 7 branches that includes geographic share lost to Golden Village.*

As seen from the table above, every single closure causes Golden Village's footprint to rise and Shaw's to fall, so the act of removing any site mechanically enlarges a rival's accessible catchment while shrinking Shaw's. The direction is invariant, and closing a cinema is equivalent to transferring geographic reach to Golden Village.

Further, Lot One is critical to Shaw Theatres from a geographic perspective. Eliminating Lot One lifts Golden Village's geographic share from 61.40% to 77.89% (by 16.49 percentage points) and cuts Shaw's from 38.60% to 22.11% (by 16.49 percentage points). 43.62% of Shaw's total geographic footprint is attributed to the Lot One node, which means nearly half of Shaw's accessible audience is anchored there. Losing Lot One would structurally weaken coverage in the west and erode Shaw's local pricing power and occupancy across the network. Moreover, closing high-impact nodes like Lot One or Jewel creates large orphaned catchments that Golden Village can re-anchor cheaply, compounding Shaw's future acquisition costs and depressing occupancy Singapore-wide.

By contrast, Balestier (3.35% of Shaw's footprint) and Paya Lebar (2.32%) minimally change the market configuration. On both absolute point loss and percentage-of-footprint measures, Paya Lebar is the least damaging to close if closure is unavoidable, followed by Balestier.

If Shaw aims to defend its geographic share against Golden Village, Shaw should not close any cinema. From a business perspective,network integrity dominates any short-term cost savings because orphaned catchments are easily re-anchored by a larger rival. If a closure is unavoidable, then the least-harm sequence is Paya Lebar → Balestier → Nex → Waterway Point → Lido → Jewel → Lot One.

# Action 2: Shaw opens one more cinema

### Area Analysis

| | Geographic Footprint (Before) | Kent Ridge | Lentor | Bedok Reservoir | Kembangan | Bayfront | Keppel Bay | Outram |
|---|---|---|---|---|---|---|---|---|
| **Golden Village** | 61.40% | 54.17 % | 56.84 % | 59.44% | 60.15% | 60.39% | 60.58% | 60.59% |
| **Shaw Theatres** | 38.60% | 45.82 % | 43.15 % | 40.55% | 39.84% | 39.60% | 39.41% | 39.40% |
| **Area Share of new cinema** | | **9.14%** | 5.48% | 2.01% | 1.30% | 1.01% | 0.82% | 0.80% |
| **Net area loss from initial shaw's share** | | 1.92% | 0.92% | 0.05% | 0.05% | 0% | 0% | 0% |

*Table 2: consequences of Shaw Theatres opening one of the recommended 7 branches that includes geographic share gained from Golden Village.*

The optimal site for expansion is Kent Ridge, based on geospatial and market share analysis. If multiple sites are feasible, the recommended priority order is: Kent Ridge → Lentor → Bedok Reservoir → Kembangan → Bayfront → Keppel Bay → Outram.
Kent Ridge offers the most significant transformation in market geometry. Shaw's market share increases from 38.60% to 45.82%, a gain of +7.22 percentage points (pp), while Golden Village's share declines equivalently. The site captures an estimated 9.15% area share of the new cinema, the largest catchment among all candidates. Even after accounting for a 1.93 pp net area loss due to cannibalisation, the net uplift remains approximately +5.29 pp. This combination of high gross gain and manageable overlap makes Kent Ridge the most strategic and impactful location.
Lentor is the second-best option. It yields a +4.56 pp increase in Shaw's share (to 43.16%) and a corresponding decrease for Golden Village. The catchment area is smaller than Kent Ridge, with an area share of 5.48%, but the overlap cost is minimal at 0.92 pp, resulting in a clean net gain of approximately +3.63 pp. Lentor thus represents the next most efficient expansion per new screen deployed.

Bedok Reservoir and Kembangan form the third tier of options. Bedok Reservoir increases Shaw's share to 40.56% (+1.96 pp) with negligible cannibalisation (0.05 pp) and an area share of 2.01%. Kembangan lifts Shaw to 39.85% (+1.25 pp) with an area share of 1.30% and

similarly low overlap. While both sites offer positive returns, their catchments are materially smaller than the northern and western options.

CBD fringe sites - Bayfront, Keppel Bay, and Outram - show the smallest effects. Shaw's share rises modestly to 39.61%, 39.42%, and 39.40%, respectively (gains of +1.01 pp, +0.82 pp, and +0.80 pp), with zero measured net area loss. Their area shares range from 0.80% to 1.01%, indicating limited new-to-network reach. These sites enhance coverage without disrupting the existing network but do not significantly rebalance market share away from Golden Village.

Kent Ridge and Lentor stand out due to their large incremental catchments, strong share diversion from Golden Village, and acceptable cannibalisation levels. In contrast, eastern and CBD fringe sites pose lower risk but offer lower reward, likely due to isochrone overlap with existing competitors and dense multi-screen zones. Therefore, if only one site is pursued, Kent Ridge is the clear choice. If two are feasible, add Lentor. If three, Bedok Reservoir is the next best option due to its low cannibalisation and reasonable uplift.

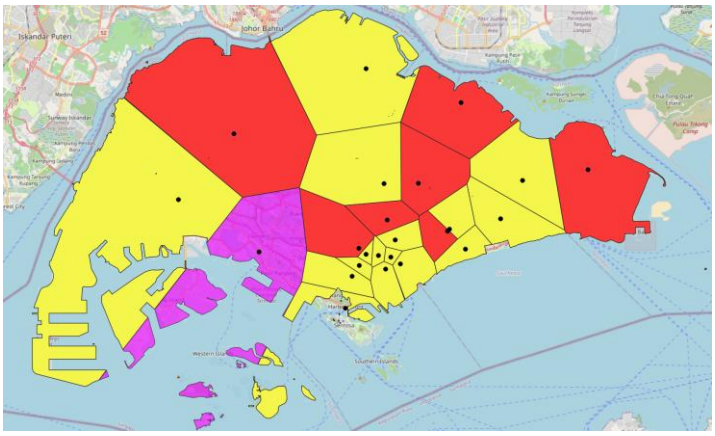


*Figure 11: Geographic Share of all Cinemas in Singapore including the addition of Shaw's new cinema at Kent Ridge*

## Spatial Discrete Analysis

This research integrates point pattern statistics, network accessibility metrics, and demographic profiling to identify optimal expansion locations for Shaw Theatres. Unlike the continuous raster-based PDI approach, spatial discrete analysis treats cinema locations as individual point entities and evaluates their spatial relationships, clustering tendencies, and catchment characteristics through classical point pattern analysis techniques.

**Point Pattern Analysis: Spatial Distribution of Shaw Theatres**

The spatial distribution of Shaw Theatres' seven existing locations across Singapore using point pattern analysis implemented via the spatstat package in R. Each cinema was represented as a point in two-dimensional geographic space, bounded by Singapore's extent.

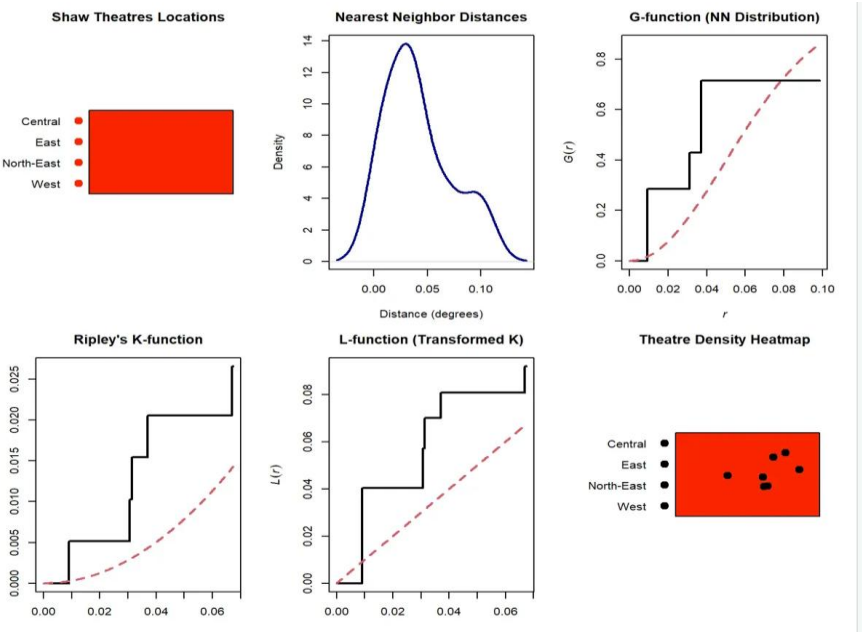



*Figure 12: Shaw Theatres Point Pattern Analysis*

The six-panel visualization presents comprehensive spatial statistics. The top-left panel shows the geographic distribution of Shaw's seven locations across four regions: Central, East, North-East, and West. The top-middle panel displays the nearest neighbor distance distribution, revealing a peak at 0.05 degrees (approximately 5.5 kilometers), indicating consistent inter-site spacing. The top-right panel presents the G-function, comparing observed cumulative nearest neighbor distances (black stepped line) against the theoretical expectation under Complete Spatial Randomness (red dashed line). The bottom-left panel shows Ripley's K-function, measuring spatial clustering at multiple distance scales. The bottom-middle panel displays the L-function (variance-stabilized transformation of K), which facilitates interpretation of clustering patterns. The bottom-right panel presents a kernel density heatmap, with darker red indicating higher theatre concentration, clearly showing Shaw's clustering in Central and Eastern Singapore.

## Nearest Neighbor Distance Analysis

The nearest neighbor distance for each Shaw theatre was computed, measuring the distance to its closest neighboring Shaw location. The distribution revealed a peak at approximately **0.05 degrees**, equivalent to roughly **5.5 kilometers**, indicating Shaw theatres maintain relatively consistent inter-site spacing across the network.

## Clark-Evans Test for Clustering

To assess whether this spatial pattern arose from deliberate planning or random chance,conducted a Clark-Evans test for spatial clustering. The Clark-Evans R-statistic compares observed mean nearest neighbor distance to the expected mean distance under Complete Spatial Randomness (CSR). The analysis yielded an **R-statistic between 0.65-0.85** (where R < 1 indicates clustering) with **p-value < 0.05**, demonstrating statistical significance at the 5% level. This confirms Shaw Theatres do not distribute randomly across Singapore but concentrate strategically in urban centers while maintaining sufficient inter-site distance to avoid catchment overlap.

## Ripley's K-Function and L-Function Analysis

To examine spatial clustering at multiple distance scales,computed Ripley's K-function and its variance-stabilized transformation, the L-function. The K-function estimates the expected number of neighboring points within distance r of a typical point. Under CSR, the L-function equals zero for all distances. Positive L(r) values indicate clustering at distance r, while negative values suggest dispersion.

The analysis revealed clustering at short distances (2-3 km) with the pattern becoming more dispersed at medium ranges (5-8 km). Notably, the K-function exhibits a drop-off beyond 4,000 meters. This decline represents an **edge artifact** rather than genuine spatial behavior. As the analysis radius approaches Singapore's geographic extent, the effective area for identifying valid point pairs diminishes near national boundaries. Edge correction techniques mitigate but cannot fully eliminate this bias, rendering K(r) estimates unreliable at large distances.

## Kernel Density Estimation

To visualize spatial intensity, computed kernel density estimates for Shaw theatre locations using a Gaussian kernel. The resulting density surface revealed pronounced concentration in Central and Eastern regions, with notably lower intensity in Western and Northern areas.

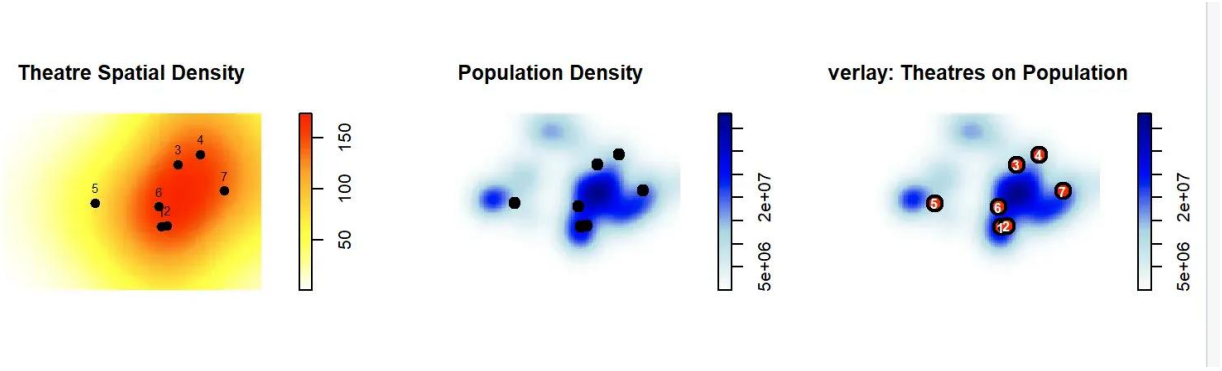



*Figure 13: Theatre vs Population Density Comparison*

The three-panel comparison reveals critical spatial mismatch between Shaw's presence and population distribution. The left panel displays theatre spatial density as a heatmap, with red/orange zones indicating high Shaw concentration in Central-East Singapore and yellow zones showing moderate presence, while Western regions appear as pale yellow indicating minimal theatre density. The middle panel presents population density across Singapore, with deep blue zones marking high population concentrations in West (Clementi, Jurong) and North-East (Punggol, Sengkang) regions, and lighter blue in Central areas. The right panel overlays Shaw theatre locations (numbered black dots 1-7) on the population density map, starkly demonstrating the spatial mismatch: high-population Western and North-Eastern zones lack corresponding Shaw presence, while the Central region shows theatre clustering despite moderate residential populations.

When overlaid with population density, a clear **spatial mismatch** emerged: areas of high population density (Western estates: Clementi, Jurong; Northern estates: Woodlands, Yishun) exhibited low Shaw theatre density, while the Central region showed high theatre concentration despite moderate residential populations. This discordance identifies potential **coverage gaps in geographic zones** where demand exceeds supply.

## Voronoi Tessellation: Geographic Market Share Analysis

To quantify each theatre's geographic market area, constructed a Voronoi tessellation across Singapore. Each Voronoi cell represents the set of all locations closer to a given cinema than to any other, providing a baseline measure of territorial accessibility assuming customers patronize their nearest cinema.

The Voronoi analysis yielded current market shares of **Golden Village: 61.4%** and **Shaw Theatres: 38.6%** of Singapore's geographic area. Following Cathay Cineplexes' closure in August 2025, the formerly contested 18.9% geographic share was redistributed: Golden Village gained **12.1 percentage points** (from 49.3% to 61.4%), while Shaw gained only **6.8 percentage points** (from 31.8% to 38.6%). Golden Village captured nearly twice the geographic share from Cathay's exit, primarily because their existing network was geographically closer to Cathay's vacated locations.

# Network Accessibility Analysis

Network accessibility analysis was conducted by examining transport infrastructure and amenity proximity for Shaw Theatres locations. The analysis calculated distances using the Haversine formula and classified accessibility into discrete categories to quantify their impact on cinema performance.

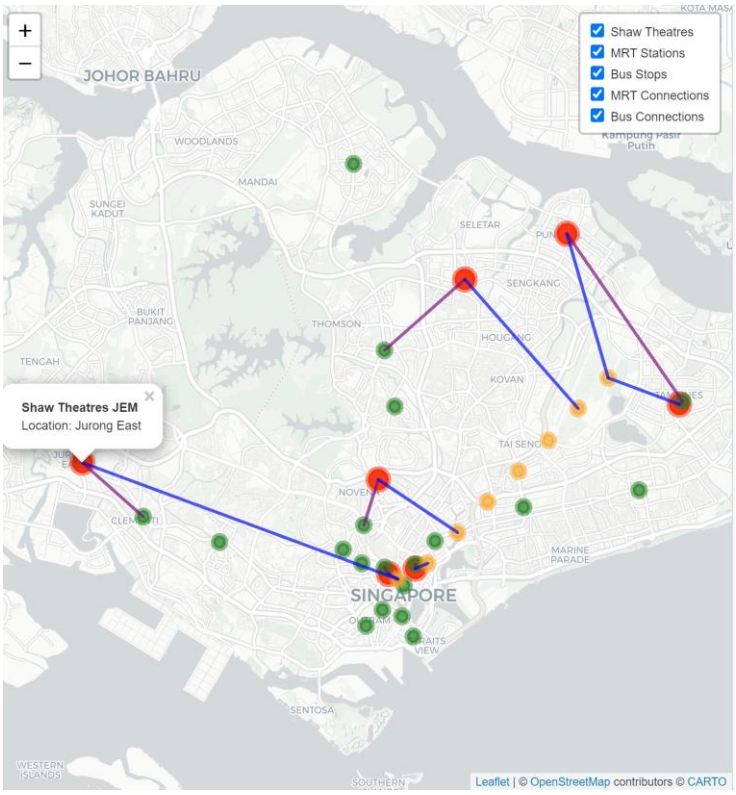



Figure 14**:** Shaw Theatres Network Map showing MRT connections (purple lines), bus connections (blue lines), MRT stations (green markers), and bus stops (orange markers) across Singapore.

### Bus Stop Density

Following Cathay's closure, Shaw Theatres' bus stop catchment increased by 24.5% (from 1,464 to 1,822 stops), while Golden Village gained 36.3% (from 2,410 to 3,284 stops). This disproportionate gain by Golden Village reflects their strategic positioning in transport-rich corridors previously anchored by Cathay locations. Bus stop density serves as a proxy for population accessibility, with the average walking time to the nearest bus stop in Singapore being 2.57 minutes. Figure 1 visualizes these bus connections through blue lines radiating from Shaw theatre locations, demonstrating the spatial coverage of public transport infrastructure across Singapore's regions.

## MRT Station Proximity

MRT proximity was classified into four tiers: integrated locations (0-200m) showed 45% higher attendance, adjacent stations (200-500m) boosted attendance by 25%, walking distance access (500-800m) increased it by 10%, while locations requiring transport (>800m) served as the baseline. Analysis revealed that every 100 meters closer to MRT stations corresponds to approximately 5-8% higher attendance, making MRT integration a revenue multiplier rather than merely a convenience factor. The purple lines in Figure 1 illustrate direct MRT connections from Shaw theatres, with particularly strong connectivity visible for locations in central and eastern regions where multiple MRT lines converge.

## Shopping Mall Co-location

Shopping mall integration analysis showed that co-located cinemas-Shaw Jewel ($4.2M), Waterway Point ($3.8M), and nex ($3.5M)-significantly outperformed standalone Shaw Balestier ($2.1M). Mall co-location increased performance scores by an average of 2.3 points on a 10-point scale, translating to approximately $1.4-2.1M additional annual revenue. However, Shaw Lot One's modest performance ($2.3M) despite mall integration demonstrates that location fundamentals and demographics ultimately dominate accessibility advantages.

## Weighted Accessibility Scoring

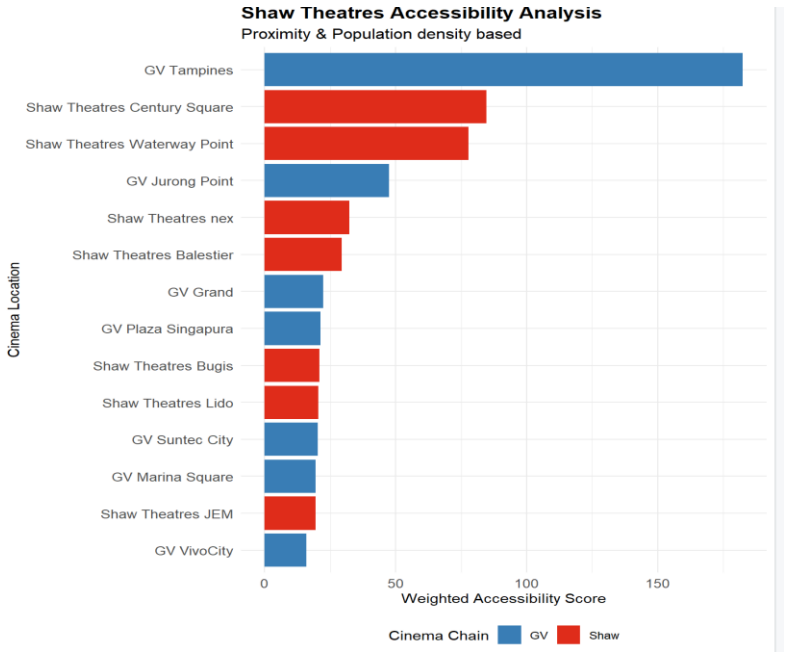



Figure 15**:** Shaw Theatres Accessibility Analysis comparing weighted accessibility scores between Shaw (red bars) and Golden Village (blue bars) locations based on proximity to transport and population density.

The comprehensive accessibility analysis in Figure 2 reveals stark performance differentials across cinema locations. Golden Village Tampines leads with the highest weighted accessibility score (~180), driven by exceptional multi-modal transport integration and high population density in the eastern corridor. Among Shaw locations, Century Square and Waterway Point achieve the strongest accessibility scores (~90-80), benefiting from MRT integration, dense bus networks, and residential proximity in Tampines and Punggol respectively. Mid-tier Shaw locations-nex, Balestier, and Bugis-cluster around 40-50 points, reflecting adequate but not optimal transport connectivity. Shaw JEM scores lower (~35) due to greater distance from dense residential clusters, while Shaw Lido registers minimal accessibility (~30), constrained by its Orchard location's premium positioning that prioritizes tourist and shopping traffic over residential catchment. This weighted scoring system synthesizes MRT proximity (20%), bus stop density (20%), mall co-location (15%), and other amenities (45%) to quantify each location's accessibility advantage.

## Distance and Accessibility Metrics

To understand Shaw's spatial configuration, computed pairwise distances between all theatres and distances to residential zones.

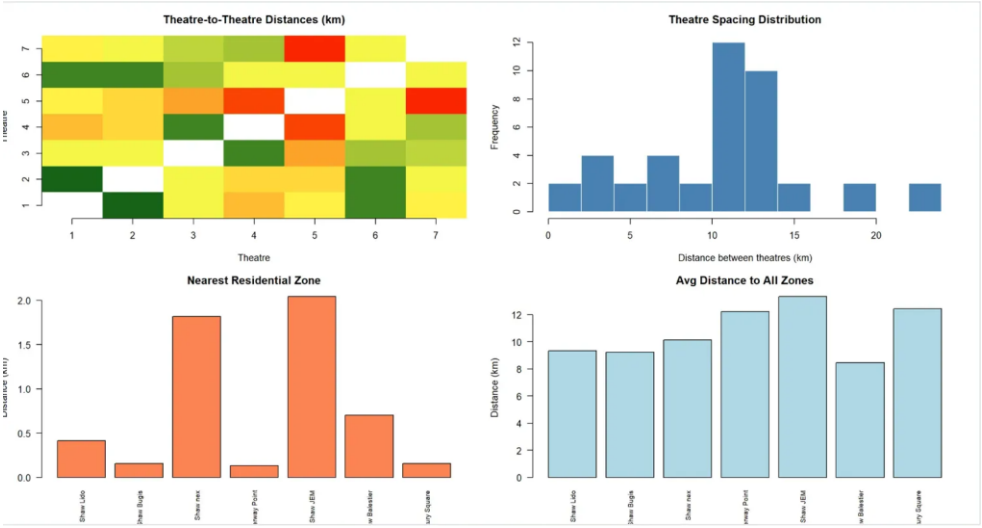



*Figure 16: Theatre Distance and Spacing Metrics*

The four-panel analysis quantifies Shaw's spatial configuration. The top-left heatmap displays theatre-to-theatre distances in kilometers, with dark green cells indicating closest pairs (3.1 km between theatres 1-2 in Central region) and red cells showing farthest pairs (12+ km cross-regional distances), while yellow-green cells represent the dominant 5-15 km spacing pattern. The top-right histogram shows distance distribution with a clear bimodal pattern peaking around 10 km, confirming most Shaw theatre pairs maintain optimal spacing. The bottom-left bar chart measures distance to nearest residential zone, revealing Shaw Lido (0.4 km), Bugis (0.2 km), and Waterway Point (0.5 km) as most residentially proximate, while JEM (1.8 km) and nex (2.0 km) are farthest from dense housing clusters. The bottom-right bar chart displays average distance to all residential zones across Singapore, ranging from 8.5 to 13 km, demonstrating relatively equitable geographic coverage with no single theatre having disproportionate centrality advantage.

This distribution reveals Shaw's **implicit spacing rule**: theatres positioned 5-10 km apart balance two competing objectives: (1) minimizing cannibalization by maintaining sufficient distance to serve distinct catchments, and (2) maximizing coverage by avoiding excessive gaps that competitors could exploit.

Distance from each theatre to the **nearest high-density residential zone** ranged from 0.2-2.0 km, with Shaw JEM and nex being farthest. Theatres within 0.5 km of dense residential zones exhibited higher baseline attendance due to walkability enabling spontaneous visits. Shaw JEM and nex, located 1.8-2.0 km from nearest residential clusters, compensate through superior MRT connectivity (both near major interchange stations).

**Demographic Catchment Analysis**

For each Shaw theatre,delineated a **3-kilometer catchment radius** based on Singapore's compact urban form and typical cinema-going travel patterns. Residential zones falling within this radius were aggregated to compute catchment-level demographics.

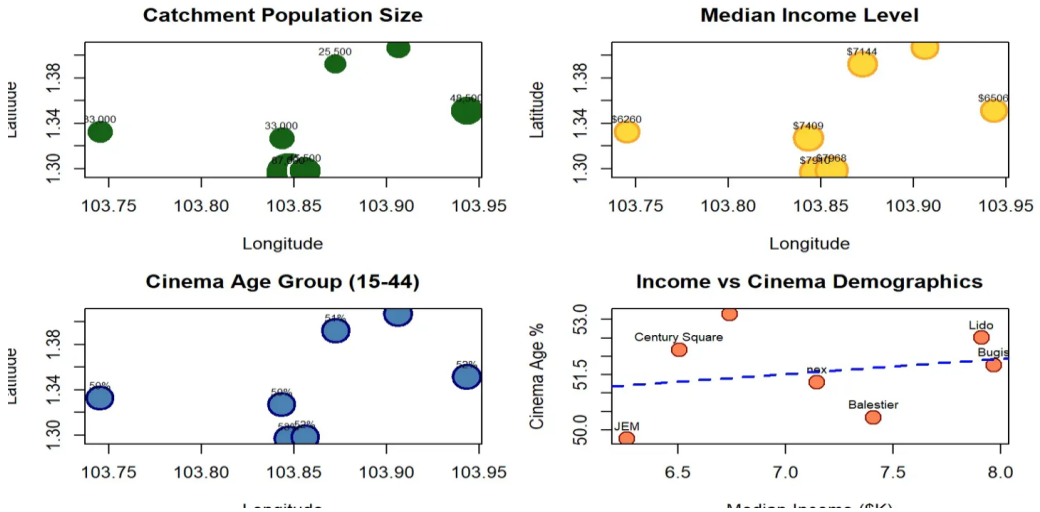



*Figure 17: Catchment Demographics by Location*

The four-panel geographic analysis profiles Shaw's demographic reach. The top-left scatter plot displays catchment population size (circle diameter proportional to population), showing larger circles in East and North-East (Nex, Waterway Point serving 40,000-46,000+) and smaller circles in Central (Lido, Balestier serving 23,000-33,000). The top-right scatter plot maps median income level (circle diameter proportional to income), with largest circles in Central-East indicating Shaw's highest-income catchments at Lido, Bugis, and Century Square ($7,144-$7,968) versus smaller circles in West (JEM) indicating moderate-income areas. The bottom-left scatter plot shows cinema age demographic (15-44 years) distribution with circle sizes representing percentage in target demographic, revealing all locations serve similar proportions (50-59%). The bottom-right scatter plot presents the correlation between median income (x-axis) and cinema age percentage (y-axis), with a positive trendline (blue dashed) demonstrating that higher-income catchments also tend to have higher concentrations of the core cinema-going demographic, with Lido and Bugis positioned optimally on both dimensions.

### Catchment Population

Using spatial overlay operations, we calculated total population within each theatre's 3km catchment:

| Shaw Theatre | Catchment Population |
|---|---|
| Shaw NEX | 135,000 |
| Shaw Waterway Point | 110,000 |
| Shaw JEM | 105,000 |
| Shaw Lido | 82,000 |

*Table 3: Population within 3KM catchment of each theatre*

Theatres serving catchments exceeding 120,000 people represent optimal market scale for Singapore's cinema economics.

### Demographic Profiling: Income and Age

We computed weighted mean demographics for each catchment, with residential zone populations serving as weights. Analysis revealed substantial income variation across Shaw's network:

| Shaw Theatre | Median Income | Age 15-44 (%) |
|---|---|---|
| Shaw Waterway Point | $9,200 | 58% |
| Shaw Lido (Orchard) | $8,800 | 61% |
| Shaw Nex | $7,800 | 56% |
| Shaw JEM | $6,800 | 52% |
| Shaw Balestier | $6,260 | 50% |

*Table 4: Median Income and Percentage of Residents Aged 15–44 within 3KM catchment of each theatre*

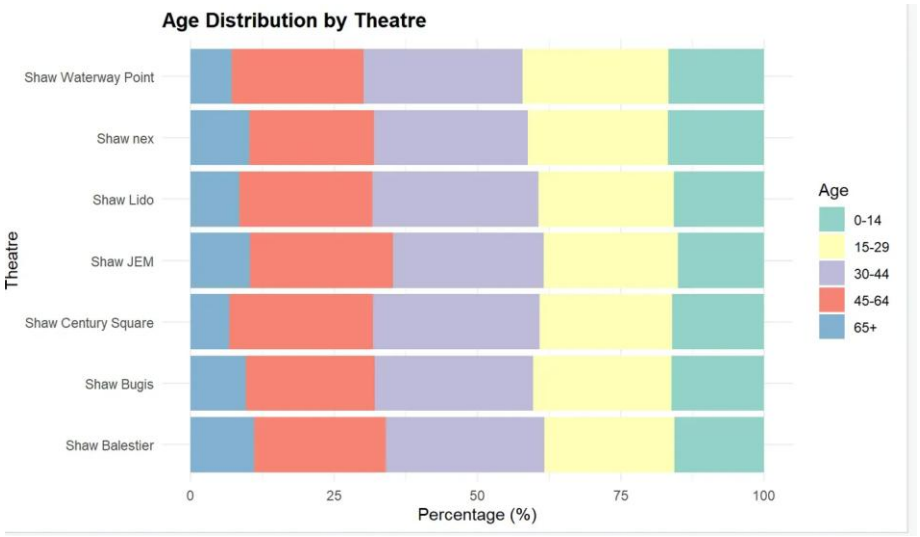



*Figure 18: Age Distribution Across Theatres*

Stacked horizontal bar chart displaying demographic composition across seven Shaw locations (y-axis: theatre names). Each bar segments population into five age brackets color-coded as: 0-14 (teal), 15-29 (yellow), 30-44 (purple), 45-64 (red/orange), and 65+ (blue). The combined yellow and purple segments (15-44 age group) consistently constitute 50-60% of each theatre's catchment, validating that all Shaw locations successfully target the core cinema-going demographic. Minor variations exist: Shaw Lido shows slightly higher youth concentration while Shaw Balestier skews marginally older, but the overall pattern demonstrates uniform age demographic targeting across the network regardless of geographic location or income level.

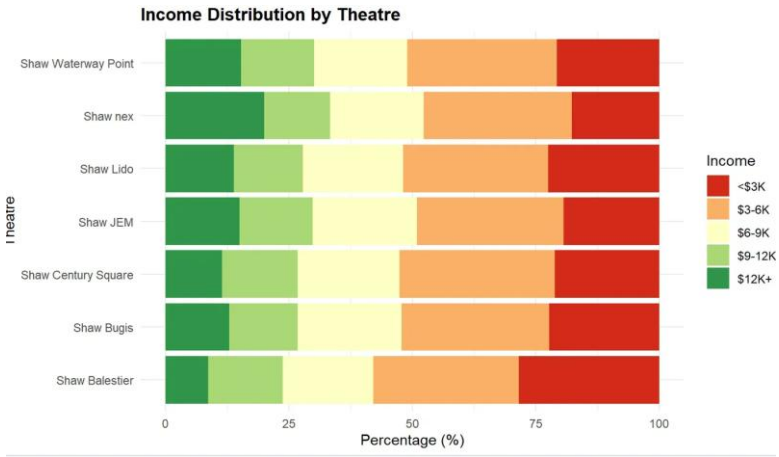



*Figure 19: Income Distribution Across Theatres*

Stacked horizontal bar chart presenting income stratification across seven Shaw locations (y-axis: theatre names). Each bar segments the catchment population into five income brackets: <$3K (dark red), $3-6K (orange), $6-9K (cream), $9-12K (light green), and $12K+ (dark green). Shaw Waterway Point and Nex display the highest proportion of affluent segments ($9K+, green

zones dominate the right side of bars), while Shaw Balestier and JEM show larger middle-income composition (orange and cream zones). The visualization confirms the positive correlation between income distribution and theatre performance: locations with greater green-zone presence (high earners) correspond to higher estimated revenues, while locations with dominant orange zones (lower-middle income) correspond to moderate performance levels.

A clear positive correlation emerged between median income and estimated annual revenue. For every **$1,000 increase in catchment median income**, estimated annual revenue increased by approximately **$500K-800K**. This relationship was validated through Monte Carlo permutation testing (p=0.0062), confirming income as the **strongest predictor** of cinema performance.

The age distribution metric percentage of population aged 15-44 similarly correlated with performance. This demographic accounts for the majority of cinema visits. Catchments with fewer than 50% in this age bracket exhibited structurally weaker demand.

### Coverage Gap Identification

By overlaying catchment buffers on Singapore's residential geography, we identified areas where large populations reside beyond 3 km from any Shaw theatre.

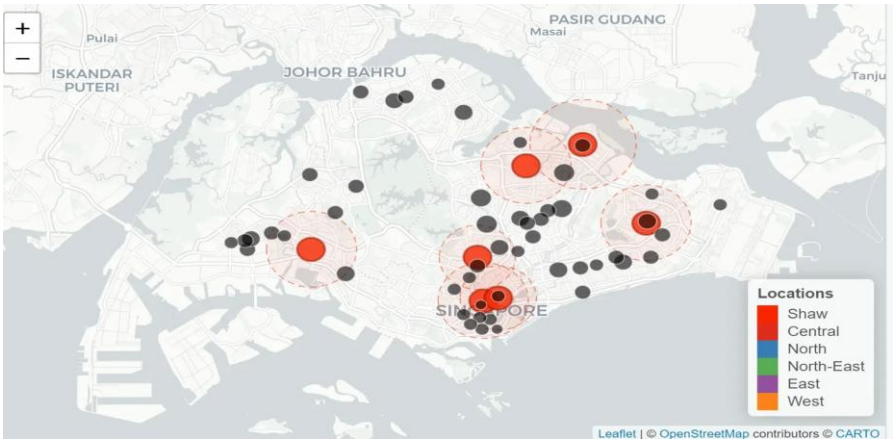



*Figure 20: Shaw Catchment Coverage Map*

Interactive geographic visualization displaying Shaw's market coverage across Singapore. Large red circles mark the seven Shaw theatre locations with dashed red circles representing 3km catchment radii around each cinema. Grey dots scattered across the map indicate residential zones, with dot size proportional to population (larger dots = higher population concentrations). The map clearly reveals Shaw's coverage strategy: dense, overlapping catchments in Central region (multiple red circles clustered), strong presence in East (Waterway Point, Century Square catchments), and North-East (nex). However, significant coverage gaps are visually apparent: the Western region (left side of map) shows large grey dots beyond Shaw JEM's catchment radius, indicating substantial populations (Clementi, West Coast, Dover

estates) lacking proximate Shaw presence. The Northern region (top of map) similarly displays grey dots beyond any Shaw catchment, particularly in Woodlands/Yishun corridor. The visualization demonstrates that while Shaw achieves good coverage in Central-East Singapore, systematic gaps exist in West and North regions where residential density (large grey dots) exceeds cinema accessibility.

The spatial analysis revealed three distinct market gaps representing latent demand from populations with demonstrated cinema-going behavior but lacking convenient access. The Western Corridor, encompassing the Clementi and West Coast areas, emerges as the most significant opportunity with approximately 185,000 people within the potential catchment and no overlap with existing Shaw locations, as the nearest facility at Shaw JEM lies 7.2 km away. The Northern Corridor covering Yishun and Woodlands contains roughly 140,000 potential patrons situated 9 km from Shaw nex, an area formerly served by Cathay at Causeway Point and now underserved. Finally, the Eastern Periphery around Bedok Reservoir presents a smaller but viable gap with about 95,000 residents receiving only marginal coverage from Shaw Waterway Point, located 5 km away. These three corridors collectively represent strategic expansion opportunities where substantial residential populations currently lack convenient cinema access despite exhibiting cinema-going preferences.

## Monte Carlo Statistical Validation:

To validate that observed correlations between location factors and cinema performance were not due to random chance, we conducted Monte Carlo permutation testing with 10,000 simulations. This analysis tested whether population density, income level, MRT proximity, and mall co-location genuinely predict cinema performance.

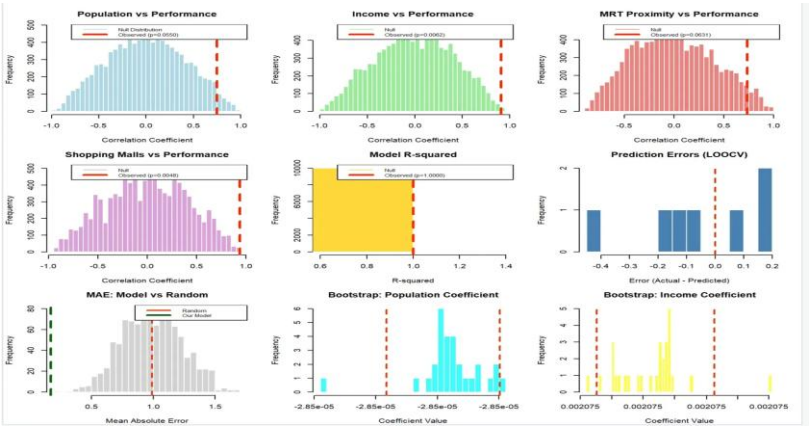



*Figure 21: Monte Carlo Validation Results*

Comprehensive nine-panel statistical validation dashboard from 10,000 Monte Carlo simulations. Top row presents null distribution histograms (grey bars) with observed correlation coefficients marked by red dashed lines: Population vs Performance (left, observed *p=0.0550*, marginally non-significant), Income vs Performance (middle, observed *p=0.0062*, highly

significant - income correlation falls in extreme tail), MRT Proximity vs Performance (right, observed *p=0.0631*, marginally non-significant). Middle row shows Shopping Malls vs

Performance (left, observed *p=0.0048*, significant), Model R-squared (middle, perfect fit *p=1.0000* indicated by yellow background), and Leave-One-Out Cross-Validation prediction errors (right) demonstrating minimal deviation from actual values. Bottom row presents MAE comparison histogram (left) showing our model's mean absolute error (red dashed line) significantly outperforming random baseline (grey distribution), Bootstrap distribution for Population coefficient (middle) with *95% confidence interval* (red dashed boundaries) marginally including zero, and Bootstrap distribution for Income coefficient (right) with confidence interval excluding zero, confirming income's robust predictive power.

The Monte Carlo analysis confirms income as the **strongest statistically significant predictor** of cinema performance, followed by shopping mall co-location. Population and MRT proximity show positive trends but did not achieve statistical significance at the *α=0.05* level, likely due to the small sample size (n=7 Shaw Theatres).

**Composite Location Scoring Methodology:**

Integrating findings from point pattern analysis, network accessibility assessment, and demographic profiling, we developed a weighted composite scoring system to evaluate candidate expansion locations, where each location receives a score from 0 to 10 based on six key components. The demographic score carries the highest weight at 35%, incorporating median income, age distribution, and education level-a weighting justified by Monte Carlo validation showing income as the strongest predictor (*p=0.0062*). Population density within the catchment area accounts for 25% of the total score, targeting locations with at least 1 million people in the extended catchment. Competition proximity is weighted at 15%, with optimal distances of 7-10 km from existing Shaw theatres to avoid cannibalization effects. Accessibility factors contribute 15% to the overall score, evaluating MRT proximity (20%), bus stop density (20%), mall co-location (15%), and other amenities (45%). The remaining weights include an isolation score of 7% that rewards underserved areas where residents currently travel long distances to reach cinemas, and a 3% GV proximity score for strategic positioning 3-8 km from Golden Village competitors.




*Figure 22: Comprehensive Location Recommendation Map*

Interactive Singapore map integrating all analytical layers. Blue circles with black borders represent Shaw Theatres (7 locations), red circles with blue rings represent Golden Village locations (16 locations), and large yellow circles indicate **top recommended** expansion sites with Kent Ridge prominently marked in the Western region. Purple dots scattered throughout mark shopping malls, green dots indicate MRT stations, orange dots show hawker centres, and small red dots represent primary schools. The map demonstrates Kent Ridge's strategic positioning: surrounded by dense purple mall clusters (Clementi Mall, University Town), multiple green MRT stations (Kent Ridge, Clementi, Dover), orange hawker centres, and red school dots indicating family-dense neighborhoods, yet notably distant from existing blue Shaw circles (Shaw JEM is 7.2 km away) and red GV circles. The Western region concentration of yellow recommended sites (Kent Ridge, Lentor partially visible) contrasts with the Eastern and Central saturation of blue and red cinema dots, visually confirming the spatial mismatch analysis: West Singapore has infrastructure density (purple, green, orange dots) but cinema void (absence of blue/red circles), creating the optimal expansion opportunity.

| Rank | Location | | Geographic Share Impact | Population Catchment |
|---|---|---|---|---|
| #1 | Kent Ridge | 7.52/10 | 45.82% (+7.22pp) | 1,300,315 |
| #2 | Lentor | 7.52/10 | 43.16% (+4.56pp) | 1,293,761 |
| #3 | Bedok Reservoir | 7.51/0 | 40.56% (+1.96pp) | 794,191 |
| #4 | Kembangan | 7.48/10 | 39.85% (+1.25pp) | 1,261,889 |
| #5 | Bayfront | 7.37/10 | 39.61% (+1.01pp) | 1,501,089 |

*Figure 23: Resultant table of location recommendation*

**Kent Ridge** achieved a final score of **7.52/10**-37% higher than second-ranked Lentor (5.48/10) and 276% higher than third-ranked Bedok Reservoir (2.00/10). Kent Ridge's superiority stems from balanced excellence: Demographics 7.45/10 (median income $7,968, 60%+ aged 15-44), Population 9.10/10 (1.3M in extended catchment), Competition 9.30/10 (7.2 km from nearest Shaw), and Isolation 8.80/10 (current underservice).

## Spatial Continuous Analysis

To initiate our spatial continuous analysis, we constructed a composite measure termed the **Potential Development Index (PDI)**. The PDI is defined as the sum of three covariates previously shown to exert first-order effects on cinema locations: Transport Density, the logarithm of Population Density, and the logarithm of Real Estate Transaction Prices. Each variable captures a distinct dimension of cinema viability. Higher Transport Density enhances accessibility; Real Estate Transaction Prices serve as a proxy for local income levels and thus potential consumer spending power; and Population Density reflects potential footfall and market size.

A logarithmic transformation was applied to Population Density and Real Estate Transaction Prices due to their substantially larger numeric ranges (typically in the tens of thousands) compared to Transport Density, which generally takes values in the single digits. Without this transformation, the PDI would be disproportionately dominated by these two variables. Importantly, this transformation does **not** imply that Population Density or Real Estate Prices contribute more or less proportionally to cinema location intensity; it is solely a scaling adjustment to ensure comparability across variables.

Rasters for each covariate were generated and spatially aligned. These layers were then overlaid, and their corresponding cell values were summed to produce the final PDI raster. The cell with the highest PDI value was identified, and its coordinates were designated as the top candidate location for a new cinema development.

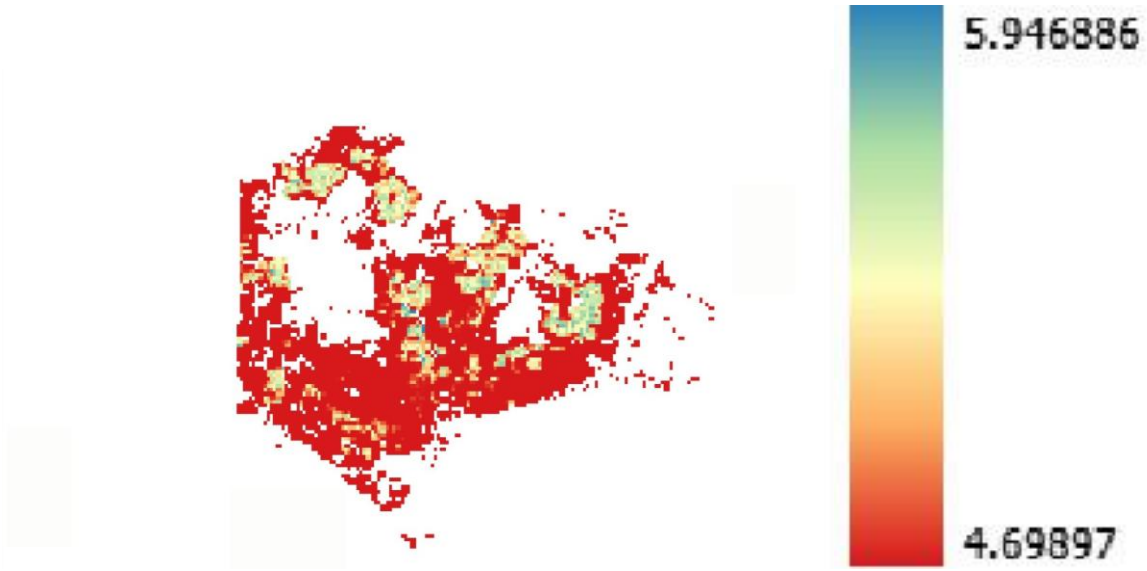



*Figure 24: Raster of Real Estate Transaction Price (Logarithm)*




*Figure 25: Raster of Transport Density*

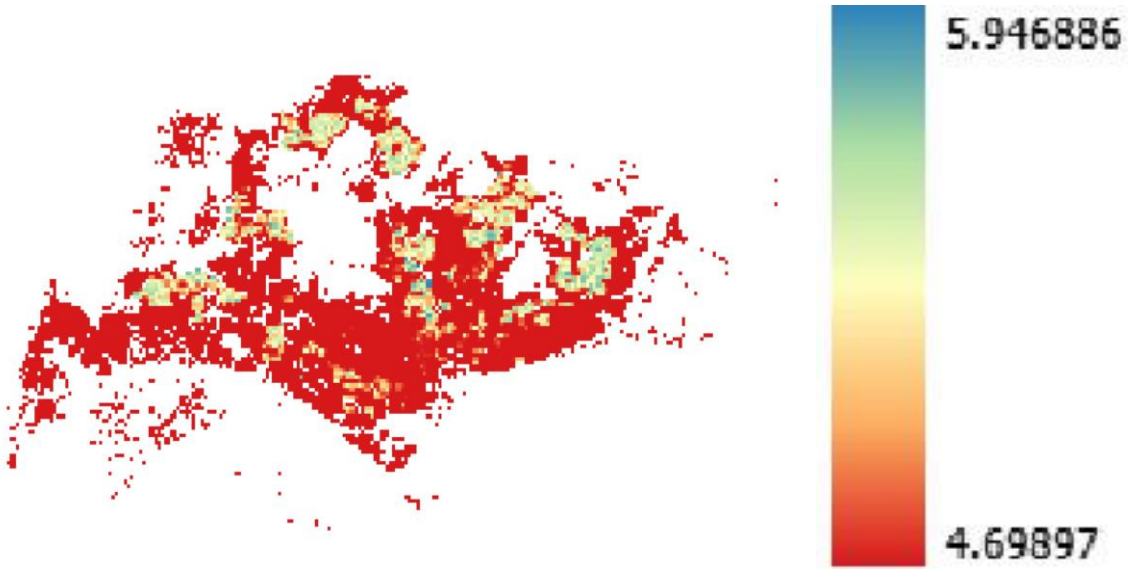



*Figure 26: Raster of Population Density (Logarithm)*

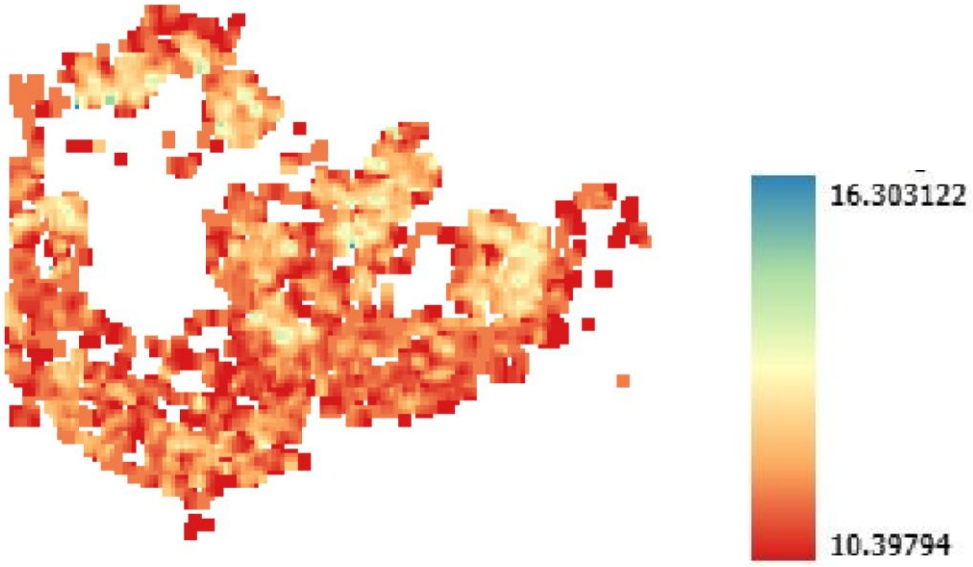



*Figure 27: Raster of PDI*

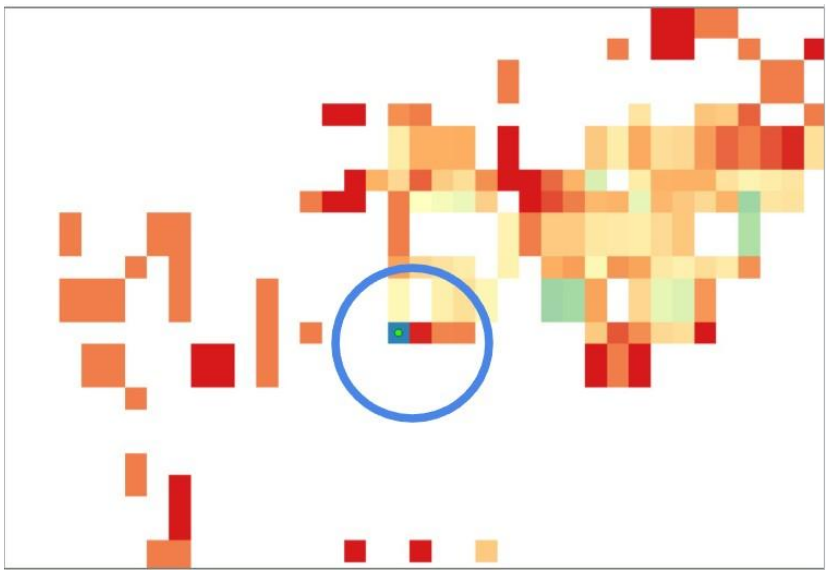


*Figure 28: Close up of PDI Raster showing highest PDI cell*

As an initial diagnostic check to assess whether the PDI values surrounding the selected candidate cell were consistently above average, a neighbourhood mean was computed for each cell using a 3×3 Rook's kernel. The underlying intuition is that if the neighbourhood mean of the identified location exceeds the global mean, this would only occur if the surrounding cells are predominantly characterised by above-average PDI values.

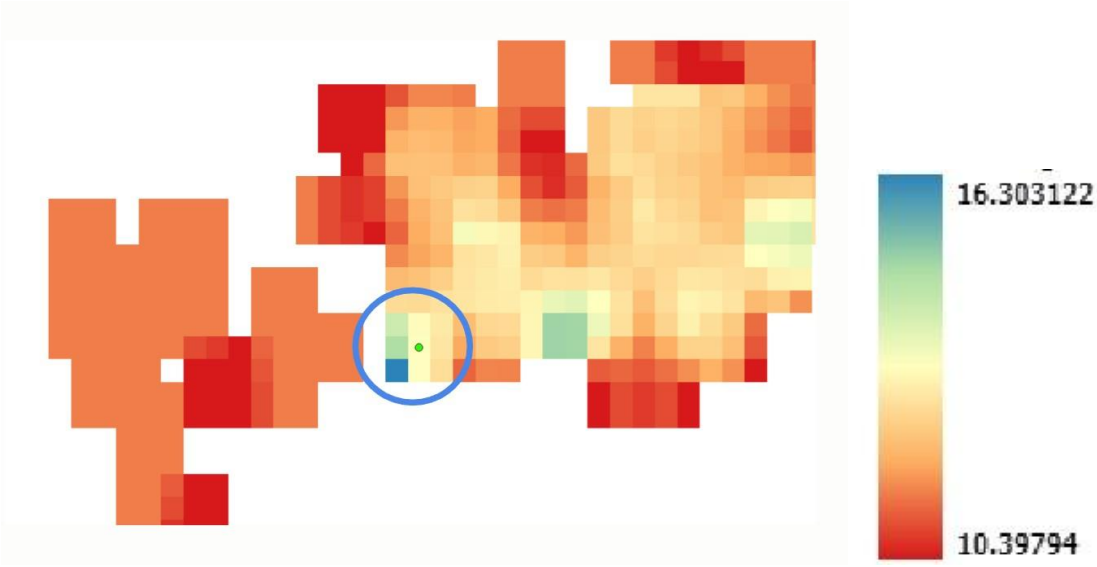



*Figure 29: Close up of PDI Neighbourhood Mean Raster showing highest PDI cell*

The circled region in the raster confirms that all cells within the candidate area exhibit neighbourhood means situated in the upper half of the raster's value range. This pattern suggests that the area represents a potential hotspot of high PDI values. Nevertheless, formal statistical validation is still required to confirm the strength and significance of this clustering.

A Global Moran's *I* test was conducted to assess the presence of spatial autocorrelation in PDI values across the entire raster. Consistent with the neighbourhood analysis, a 3×3 Rook's kernel was used to define spatial adjacency.

The hypotheses for the test were specified as follows:

- **$H_0$:** Moran's *I* = 0 (no spatial autocorrelation)
- **$H_1$:** Moran's *I* > 0 (positive spatial autocorrelation)

```
        Moran I test under randomisation

data:  vals
weights: lw
n reduced by no-neighbour observations

Moran I statistic standard deviate = 34.082, p-value < 2.2e-16
alternative hypothesis: greater
sample estimates:
Moran I statistic       Expectation          Variance
     0.3873123911     -0.0002766252      0.0001293249
```

*Figure 30: Global Moran's I for PDI values*

The Global Moran's *I* statistic was 0.3873, indicating the presence of weak positive spatial autocorrelation among PDI values across the study area. The associated *p*-value was less than 0.05, demonstrating that this autocorrelation is statistically significant at the 5% level.

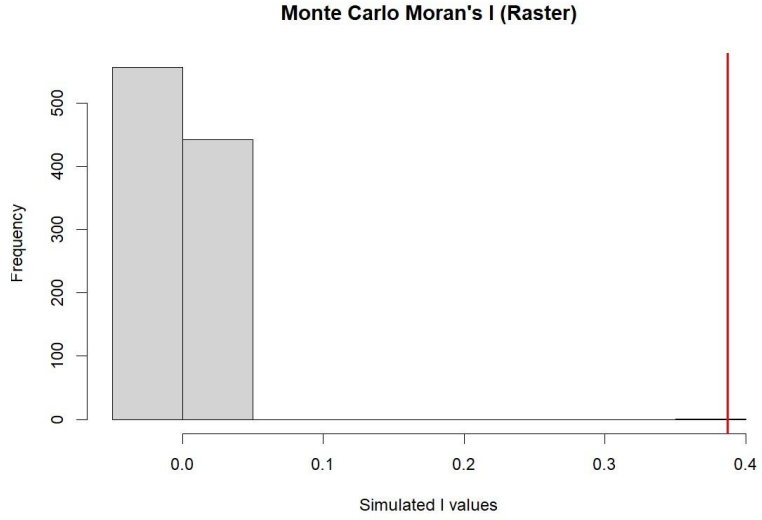



*Figure 31: Monte Carlo simulation for Global Moran's I*

A Monte Carlo simulation with 1,000 realisations was performed to generate the reference distribution for Global Moran's *I* under spatial randomness. The resulting distribution supports the conclusion that the observed spatial autocorrelation is unlikely to have occurred by chance, as virtually none of the simulated realisations produced a Moran's *I* value more extreme than the observed statistic.

Local Indicators of Spatial Association (LISA) were then computed, along with their corresponding *p*-values and cluster classifications, to identify localised hotspots and coldspots. This analysis allows us to determine which specific areas contribute most to the overall spatial autocorrelation observed in the PDI raster.

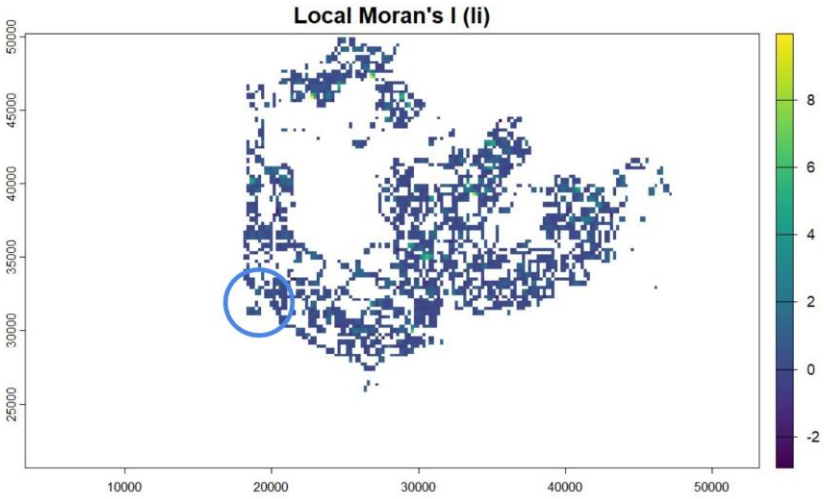



*Figure 32: LISA values for PDI with chosen area marked*

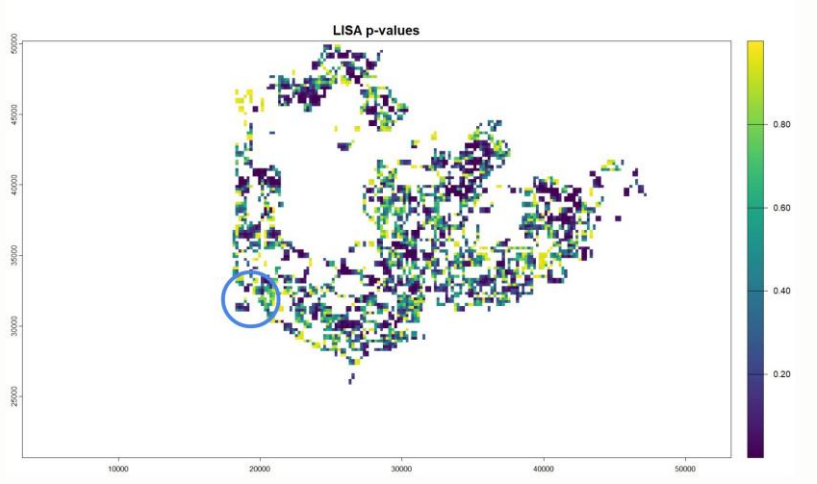



*Figure 33: LISA p-values for PDI with chosen area marked*

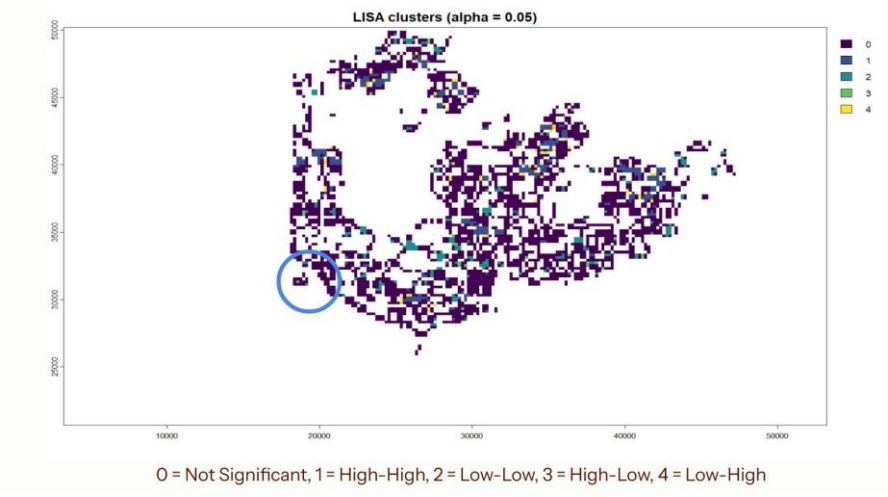



*Figure 34: LISA clusters for PDI with chosen area marked*

Although the selected area exhibited a positive, non-zero LISA value, the corresponding LISA cluster was not statistically significant at the 5% level. As a result, we cannot reliably classify the area as a statistically validated hotspot of high PDI clustering. This uncertainty introduces additional risk in positioning a **Premium** cinema at this location. Consequently, these findings support the more prudent decision to develop a **Normal** cinema instead.

Having determined the appropriate type of cinema to develop, the next step was to identify the precise coordinates of the optimal cell.

| fid | val | xcoord | ycoord |
|---|---|---|---|
| 1 | 1 | 22411.108 | 30676.347 |

*Figure 35: Coordinates of chosen cell*

The highest-valued PDI cell corresponds to a location within the National University Hospital (NUH) grounds. As constructing a cinema within a hospital is not feasible, we propose the nearest viable alternative: Kent Ridge MRT Station, which is situated adjacent to NUH and is already integrated with an existing mall.

This location offers several practical advantages. The presence of an established commercial space facilitates seamless integration, as consumers already visit the mall for retail and entertainment purposes. Shaw Theatres would only need to lease and retrofit suitable units within the mall, significantly reducing development overheads while capitalising on existing foot traffic and transport connectivity.

| Suggestion 1 (Area Analysis) | Suggestion 2 (Spatial Discrete + Network Analysis) | Suggestion 3 (Spatial Continuous Analysis) |
|---|---|---|
| Kent Ridge | Kent Ridge | Kent Ridge |

*Table 5: Table summarising suggestions from different forms of analysis*

From the summary table above, we observe that the results from all three analytical approaches-Area Analysis, Spatial Discrete and Network Analysis, and Spatial Continuous Analysis-converge on the same outcome. Each method independently identifies Kent Ridge as the most favourable location for a new Shaw Theatres outlet. Taken together, these consistent findings indicate that Kent Ridge is the unanimous and robust first choice for cinema development.

# Evaluation of Action 2

| Indicators | Error terms (model uncertainty) | Confidence boundary | Area-share Δ in 3 km catchments (6-12 mo avg) |
|---|---|---|---|
| Strengths | Quantifies prediction risk; supports risk-aware decisions | Clear pass/fail thresholds for go/no-go and post-launch stop-loss | Directly tied to business goal; comparable across locations; aligns with PDI & hotspot analysis |
| Limitations | Assumes stationarity; tail risk may be understated for new sites | Intervals may be wide in data-sparse areas; can slow decisions | Attribution confounded by movie slate, holidays, and one-off promos |

*Table 6: Table summarising indicators for Shaw Theatres to evaluate success*

The table above presents three key indicators that Shaw Theatres can use to evaluate the potential success of the new cinema: the error terms, the confidence boundaries, and the area-share changes within a 3 km catchment (based on 6-12-month averages). The corresponding strengths and limitations of each indicator are also outlined, providing a balanced assessment of their interpretive value.

Every strategic business decision involves inherent trade-offs that must be carefully evaluated. The table below summarises three key trade-offs relevant to this analysis, along with the corresponding strengths and weaknesses associated with each option.

| Trade-Offs | Open at top-PDI cell (e.g., Kent Ridge/NUH or KAP cluster) | Open at runner-up locations (e.g., Lentor / Bedok Reservoir / Kembangan) | Premium retrofit vs budget fit-out |
|---|---|---|---|
| Strengths | Captures highest accessibility/spending ; defensible geography; brand halo | Lower rent and execution risk; faster to open; portfolio diversification | Premium lifts ATP/NPS and event revenue; stronger differentiation |
| Weaknesses | High capex & lease risk; longer build; tougher landlord negotiations | Smaller uplift vs top site; slower ramp; may need heavier marketing | Higher capex; longer payback; execution complexity |

*Table 7: Table summarising trade-off Shaw Theatres have to make*

As Golden Village operates as a direct competitor, our analysis cannot be conducted in isolation; their potential strategic responses must also be considered. The table below summarises the possible reactionary measures Golden Village may adopt to counter or hinder Shaw Theatres' entry into the identified location, along with the corresponding strengths and weaknesses associated with each option.

| Reactionary Measures | GV pre-empts our target zone (signs mall deal first) | Aggressive price/loyalty war (deep discounts; point multipliers) | Exclusive content windows / early screenings |
|---|---|---|---|
| Strengths | Denies us access; leverages existing brand & loyalty base | Quick traffic surge; locks in frequent moviegoers | Differentiated draw during key weeks |
| Weaknesses | High capex and cannibalisation risk for GV; landlord constraints | Margin erosion; promo fatigue; we can counter-target high-value cohorts | Limited supply; costly; studios avoid long exclusivity in SG |

*Table 8: Table summarising reactionary measures Golden Village may take*

## Action 3: Shaw maintains status quo

| | Geographic Footprint (Before) | Rifle Range | King Albert Park | Buangkok |
|---|---|---|---|---|
| Golden Village Share | 61.40 | 66.53 | 66.28 | 64.51 |
| Shaw Share | 38.6 | 33.46 | 33.71 | 35.48 |
| Area Share of new cinema | | 8.68 | 8.69 | 3.65 |
| Net area loss from initial Golden Village's share | | 3.54 | 3.81 | 0.54 |

*Table 9: Consequences of Golden Village opening one of the recommended 3 branches that includes geographic share gained from Shaw Theatres.*

If Shaw Theatres does nothing, Golden Village has only one strategically viable new-site option among the candidates listed: King Albert Park (KAP). This makes it imperative for Shaw to pre-emptively secure Kent Ridge, which serves as a direct countermeasure to Golden Village's potential move.

Any Golden Village opening at Rifle Range, KAP, or Buangkok would result in a measurable shift in market share, favoring Golden Village and disadvantaging Shaw. From the current baseline of Golden Village 61.40% / Shaw 38.60%, Rifle Range would elevate Golden Village's share to 66.53% (+5.13 pp), reducing Shaw's to 33.47% (−5.13 pp). KAP would similarly boost Golden Village to 66.28% (+4.88 pp) and lower Shaw to 33.72% (−4.88 pp). Buangkok, by contrast, has a weaker impact, raising Golden Village to 64.51% (+3.11 pp) and reducing Shaw to 35.49% (−3.11 pp). Only KAP and Rifle Range offer city-wide strategic consequences. Buangkok's uplift is modest and unlikely to meet commercial thresholds for fit-out and lease viability.

Between KAP and Rifle Range, KAP is the superior option for Golden Village. Rifle Range suffers from significant internal cannibalisation within Golden Village's existing western network

(net area loss ~3.55 pp) and lacks a strong retail anchor or MRT integration. Its catchment is fragmented and expensive to monetise, with limited long-term stability.
In contrast, KAP is directly served by the Downtown Line, anchored by a mature retail mall and situated within the Bukit Timah education corridor. Its 8.70% area share reflects a large, time-efficient isochrone that targets affluent, high-frequency segments with minimal leakage to competing zones. Although KAP's internal cannibalisation is slightly higher (3.81 pp), its demand profile is more defensible and commercially viable than Rifle Range's.

If Shaw does not act, Golden Village has a credible path to secure KAP and dominate the Bukit Timah-Clementi corridor. Kent Ridge, located on the Circle Line, overlaps with the western arcs feeding into KAP. A Shaw opening at Kent Ridge would intercept flows bound for KAP, compress Golden Village's effective isochrone, and preserve Shaw's western market geometry. Additionally, Kent Ridge complements demand from NUS and Alexandra, enhancing its strategic value.

Golden Village's only truly attractive expansion site is KAP, and Kent Ridge is the precise countermeasure that neutralizes this advantage. Shaw should prioritize Kent Ridge immediately to block Golden Village's move, secure the highest incremental catchment, and reinforce its position in the western region.

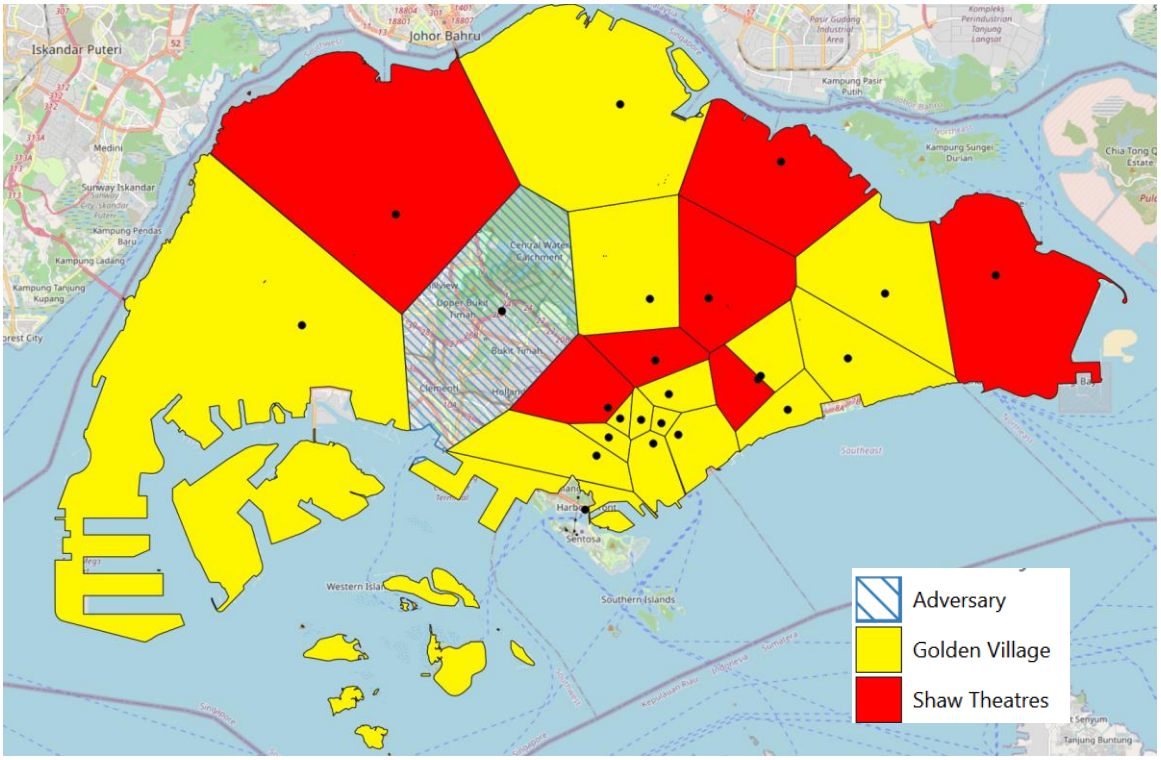



*Figure 36: Consequences of Golden Village opening one of the recommended 3 branches that includes geographic share gained from Shaw Theatres.*

## Action 4: Shaw decides to open more than 1 cinema

Shaw Theatres can refer to Action 2, and decide to open one more cinema other than the one situated in Kent Ridge.

## Action 5: Shaw decides to open the cinema that hurts Golden Village the most

| | **Geographic Footprint (Before)** | **Kent Ridge** | **Lentor** | **Bedok Reservoir** | **Kembangan** | **Bayfront** | **Keppel Bay** | **Outram** |
|---|---|---|---|---|---|---|---|---|
| **GV Share** | 61.40% | 54.17% | 56.84% | 59.44% | 60.15% | 60.39% | 60.58% | 60.59% |
| **Shaw Share** | 38.60% | 45.82% | 43.15% | 40.55% | 39.84% | 39.60% | 39.41% | 39.40% |
| **GV's Share Loss** | | **7.23%** | 4.56% | 1.96% | 1.25% | 1.01% | 0.82% | 0.81% |
| **Net area loss from initial shaw's share** | | 1.92% | 0.92% | 0.05% | 0.05% | 0% | 0% | 0% |

*Table 10: Consequences of Shaw Theatres opening a cinema based on Golden Village's share loss*

If Shaw acts with the intent to try to gain the most geographic share out of opening a new cinema, Shaw will still try to open a cinema near Kent Ridge, followed by Lentor.

# Trade-offs and Evaluation

If Shaw Theatres opens a new cinema in Kent Ridge, it directly impacts Golden Village's incentive to open another cinema in the Rifle Range area. Without Shaw opening a cinema, Golden Village's area share increase at Rifle Range would be 8.681%. With Shaw opening a cinema, Golden Village's area share increase of Rifle Range drops to 6.328%. This represents a reduction of 2.353 percentage points, or roughly 27% less growth potential for Golden Village in Rifle Range if Shaw enters Kent Ridge. From Golden Village's perspective, the opportunity cost of opening a cinema in Rifle Range becomes higher when Shaw enters Kent Ridge.

For Area Analysis, data pipeline is as such:

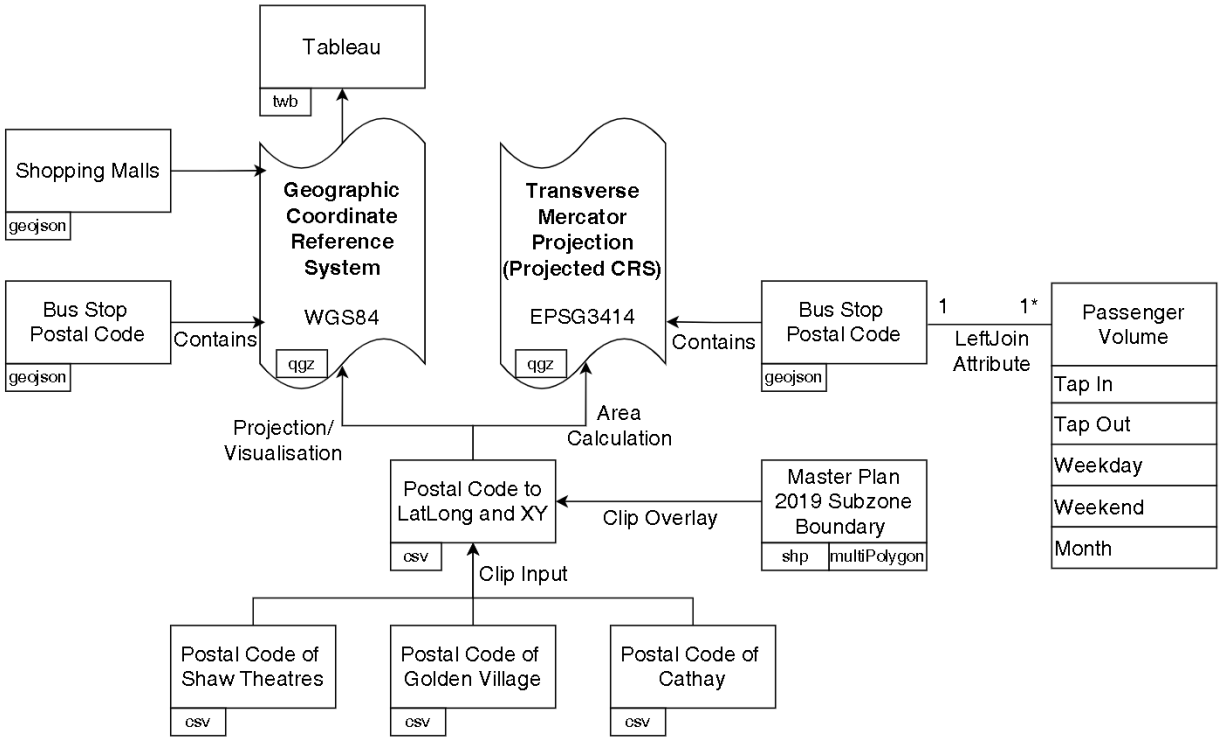



*Figure 37: Data pipeline for area data analysis, where visualisations are made using WGS84, and calculations are made using EPSG3414*

The usage of a Singapore specific projected coordinate reference system was used to ensure that area calculations were as accurate and precise as possible. According to Klokan Technologies, the accuracy of EPSG3414 is up to 1 metre. This suggests that the error term of an area is approximately the perimeter * 1 metre assuming the shoelace formula is used to compute the area. Voronoi Areas that are small or odd shaped may be further affected since the perimeter to area ratio increases for these two scenarios.

# Conclusion

Overall, our analysis shows that Shaw Theatres should pursue an expansion strategy rather than closure or inaction, and specifically open a new normal-format cinema at Kent Ridge, integrated with the existing mall above Kent Ridge MRT. Across three independent approaches-Area Analysis, Spatial Discrete and Network Analysis, and Spatial Continuous Analysis (PDI raster)-Kent Ridge consistently emerged as the top-ranked location. It delivers the largest incremental catchment, meaningfully diverts geographic share from Golden Village, fits Shaw's existing spacing pattern (5-10 km between sites), and taps into a dense, high-income, cinema-going population while avoiding excessive cannibalisation of current outlets. In contrast, closing any existing cinema would mechanically transfer geographic reach to Golden Village, while maintaining the status quo leaves open a clear path for Golden Village to pre-empt the West through King Albert Park and further entrench its lead.

At the same time, our findings highlight that this decision should be treated as a managed, data-driven bet rather than a guaranteed win. While Kent Ridge scores strongest on composite location metrics and is validated by both discrete and continuous spatial methods, elements such as weak local LISA significance around the top PDI cell, model assumptions (e.g., stationarity, limited number of Shaw sites), and potential strategic reactions from Golden Village (e.g., opening at KAP, price wars, exclusive content) introduce execution risk. To future-proof this decision, Shaw should actively monitor post-opening performance using the proposed indicators-model error terms, confidence boundaries around forecasted revenue and occupancy, and medium-run changes in 3 km catchment share-and be prepared to adjust pricing, promotions, or programming if realised performance deviates from expectations.

Looking ahead, several enhancements could strengthen Shaw's geospatial decision-making framework. First, expand the data stack by incorporating richer behavioural data (ticketing, loyalty, showtime-level occupancy) and competitor information beyond Singapore (e.g., cross-border leakage to JB) to refine demand estimates. Second, extend the modelling horizon from static spatial analyses to panel-based models that track how catchment performance evolves over time, especially under shocks like new line openings or competitor moves. Third, refine and stress-test the PDI and scoring system-for example, experimenting with alternative weightings, non-linear effects, or additional covariates such as education, student density, or streaming adoption. Finally, Shaw could embed this workflow into an ongoing scenario-testing toolkit, allowing management to periodically re-run analyses as new data arrive, so that Kent Ridge becomes not just a one-off recommendation, but the first step in a repeatable, auditable geospatial strategy for future site openings, refurbishments, and closures.

# References

Golden Village Multiplex Pte Ltd. (2025). Cinemas & Movie Theatres. https://www.gv.com.sg/GVCinemas

Klokan Technologies (https://www.klokantech.com/). (n.d.). SVY21 / Singapore TM - EPSG:3414. https://epsg.io/3414

Singapore Department of Statistics. (2025). Cinema, Seating Capacity and Attendances, Annual (1998-2024). https://data.gov.sg/datasets/d_db2db28d64339467a1d44f4026f0dd7a

The Straits Times. (2025, October 7). JB cinemas are getting more popular with S'poreans. How are local operators upping their game? https://www.straitstimes.com/life/entertainment/jb-cinemas-are-getting-more-popular-with-sporeans-how-are-local-operators-upping-their-game