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University of Wales Trinity Saint David DBA Programme

Module: Approaches to Research and Academic Communication

Module Code: HKMB7000

Lecturer: Dr Chammy Lau Internal Verifier: Prof. Peter Fong

Research Proposal:

**A comparative study on the business and financing models
for MTRC of Hong Kong and for other leading railways in the world:**

How sustainable is MTRC's model through the time?

Can it be replicable?

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19 September 2022

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Abstract

This research study is to conduct an organization-wide comparative analysis of MTRC of Hong Kong and the leading passenger-focussed railways companies in the world to examine their corporate business models in order to achieve successful organisational results defined in international best practices and standards. Through investigating in the key financial and operational performance indicators, this study attempts to understand factors for railways companies contributing to their success in achieving the organisational as well as social objectives. Focus will be put on the following key research questions:

- (a) What are the underlying key success factors for making a railway company profitable and efficient in providing mass transit and related services/products to the customers?
- (b) What is the contemporary model for long-term sustainability of the business operations of such organisation?
- (c) Does the real life operational and financial data support the above model by way of hypothesis testing?
- (d) What are the key challenges ahead? What would be recommended strategy and action plan for meeting such challenges?

In light of the policy of decarbonisation due to the concerns over the global climate change, there would be increasing tendency for governments to increase utilization of electrified railway systems for achieving carbon emission neutrality in accordance with their respective nationally determined targets. Hence, it would be timely to revisit and identify which railway infrastructure business and financing model would enable railway companies to achieve financial self-reliance and resilience, with minimal level of government financial support. This would avoid increasing the financial burden to the governments.

To fill the research gap observed from the literature review, hypothesis testing will also be conducted in this research on the cost recovery ratio for each of the selected railway companies to examine whether the group of companies based on the Rail+Property Development Model have been performing better financially (i.e. financially self-reliant and resilient) than the other group that are not based on this model. Hope this research can contribute to supplementing the body of knowledge in this aspect.

Chapter 1: Research Background

1. Research Problems and Objectives

1.1 Macroeconomic / Industry / Corporate Background

Transportation is essential for moving people and goods from one place to another, promoting business and trades to bring benefits to enterprises and households. Among various means, railways have been one of the essential means of transportation globally for more than a century.

However, financing for railways infrastructure development and operations has been a billions-of-dollar question for many countries. For instance, the German Government needed to provide government funding to Deutsche Bahn (DB) of EUR1.42 bn in 2020 and EUR3.6 bn in 2021 respectively, in order to keep the German railway system running (DB Integrated Report 2021, page 198). In addition, the German Government also provided 'Train-path price subsidy of EUR2.1 bn for each of the year 2020 and 2021 to tackle the COVID-19 pandemic.

Similarly, the US Federal Government had to provide USD6.73 bn to Amtrak in FY2022 to keep the passenger railroad company alive. (Amtrak General & Legislative Annual Report & FY 2023 Grant Request, page 8).

Separately, pursuant to the policy of decarbonizing their economies following the signing of the Paris Agreement under the United Nations Framework Convention on Climate Change initialled in December 2015, many countries, including the USA (Amtrak Company Profile FY2021, page 4), Germany (DB Spring Roadshow 2022, slide #11) and the UK (Williams-Shapps Plan for Rail, page 16), have subscribed to the idea of promoting higher utilization level of electrified railway at the expense of other transport vehicles, as supported coherently by many scientific research reports. These scientific reports point to the common finding that railways are emitting the least carbon dioxide gas (one of the prominent greenhouse gases) than other vehicles such as aircraft, cars and ships. For instance, the USA Federal Government will deploy funding related to the Infrastructure Investment and Jobs Act (November 2021):

- (a) USD 22 bn over next 5 years for CAPEX & USD 44 bn advance appropriations for rail programs over next 5 years.
- (b) USD19.2 bn Reauthorization of rail funding for next 5 years (USD3.8 bn annually on average) and FRA competitive grants of USD 15.3 bn (USD3.1 bn annually).

Hence, the role of railway would be expected to become much more important in the coming decades. Whether the construction or modernisation of railway infrastructure can be properly and adequately financed would be of utmost importance. This would also have significant implications to the health of the government financial positions.

This proposal focuses on the key issues relating to the adoption of business, technology and process for providing railway services to passengers, instead of freight carriers.

Now let us turn our attention to the individual railway companies. With a total route length of 240 kilometres and about five million passengers on an average weekday, the Mass Transit Railways (“MTR”) system in Hong Kong is well regarded by many local as well as foreign people.

Certain public opinions on the MTR are rather revealing. Sigalos (2015), a foreign journalist, opined that “MTRC was an impressive subway system, with more than 5 million daily commuters, 99.9% on-time arrival rate, incredibly cheap fares (USD0.5 to USD3), which was able to cover roughly 175% of the system’s operating costs”.

Later, Leong (2016), the then Chief Executive of MTRC, asserted that “Hong Kong’s successful self-financing formula, the ‘Rail plus Property Model’ (the term being used by Cervero and Murakami, 2009), has demonstrated how integrating railway expansion with property management can help make public transit systems financially self-reliant while also promoting sustainable urban growth.”

The objective of this study is to conduct an updated evaluation of MTR’s corporate performance through a comparative analysis of the world’s leading railways companies and to understand their corporate business models, international best practices and standards contributing to their success in achieving organizational as well as social objectives.

1.2 Literature Review and Definition of the Research Problems

In the light of the above Sigalos’ opinion (2015) and Leong’s assertion (2016), a literature review and an exploratory research were conducted. The first comprehensive scholarly study on the railway infrastructure development and financing model on the MTR of Hong Kong was found to be done by Tang, Chiang, Baldwin and Yeung (2004), in which the term “Integrated Rail-Property Development Model” was first adopted. With the title “Study of the Integrated Rail-Property Development Model in Hong Kong”, this study report highlighted

that the integrated rail-property development model of the MTRC has been successful for Hong Kong, in the sense that it had been achieving positive operating profit, without requiring government funding since its establishment in mid-1970s. These pleasing results were due to the contribution of the four principal elements, namely:

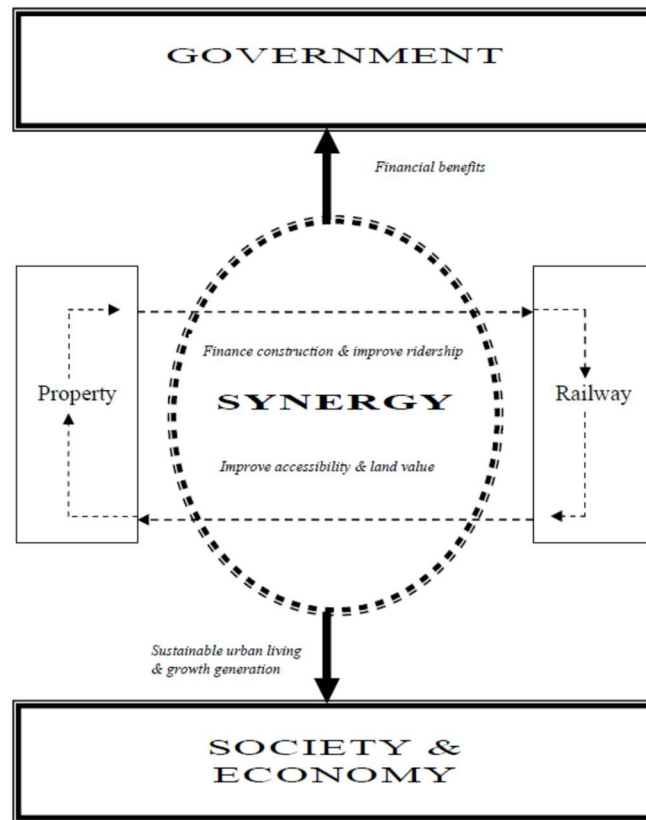
- (a) favourable government policy;
- (b) superb planning, management and control procedures and effective development processes;
- (c) high-quality real estate projects; and
- (d) a well-experienced and efficiently managed company and organization.

(Tang, et al (2004), Executive Summary, page ii).

According to the findings of the study, the Integrated Rail-Property Development model is expected to generate the following key social and economic benefits (refer to Exhibit 1 below):

- (a) Railway - Urban rail transit will significantly improve the land value around the stations. By capturing these values through property development and other means, the railway operator can finance the construction of the railway.
- (b) Property - Intensification of development density of the land around railway stations will improve the ridership of the railway and hence its operational viability.
- (c) Government - can receive financial gains in terms of the land premiums generated from property development of the station sites, a higher level of rates from private properties with improved accessibility and other monetary returns on railway operations (if owned by the government). Furthermore, the government is not required to subsidize the operations of the railways if it is financially sustainable.
- (d) Society and economy – The society at large achieves a more sustainable form in terms of the compactness of urban development, more efficient use of scarce urban space, more open space, less urban sprawl, fewer roads, reduced air pollution from cars, and improved pedestrian-friendly environment. All these features can enhance the overall quality of urban life characterized by improved health, better convenience, greater diversity of lifestyle and more time saving. The economy will equally be benefited as a result of the improved efficiency in transport and human activities.

Synergy of Integrated Railway and Property Development Model



Source: Tang, et al (2004), Figure 2.1

In addition, Tang, et al (2004) also did a comparative study of ten cities including Hong Kong. The study confirmed the economic benefits of financial synergy and risk diversification generated from integrated railway and property development by the MTRC. In general, MTR achieved virtually zero rate of market return on its railway, meaning that its railway investment was not financially viable on its own.

MTRC has much higher proportion of property revenues, lower level of debt and higher profitability than many of its private Japanese counterparts, which also jointly operate railway and property development business.

Similarly in Japan, the mass transit railway is unlikely to be self-financing on its own. Almost all of them need to rely on government subsidies. Hopefully, Japanese Railways companies rely on the profits from real estate to subsidize its railway operations, in addition to the generous government subsidies.

Later in 2009, Cervero and Murakami referred this development model to as “Rail + Property” model (“R+P model”) and further confirmed that the R+P projects in Hong Kong with emphasis on improved pedestrian quality (with a distinctively transit-oriented design), have led to gains in housing prices (in the range of 5-30 percent) and ridership (35,000 additional weekday passengers for a R+P station). Not only had this R+P model been serving Hong Kong well and is still a viable model, the transit value capture of this model was also recommended to other cities, such as those fast-developing cities in the Mainland China, for replication. Cervero and Murakami (2009) also pointed out that R+P financing model was not first adopted by Hong Kong, but by a streetcar company in San Francisco more than 100 years ago (Cervero and Murakami, 2009, page 2039). Cervero and Murakami (2009) believed that “Hong Kong’s R+P model, is the best template available for sustainably transit and building cities”. (page 2041)

Literature review: findings and proposed supplemental analysis

There were two aspects of the scholarly research reports which may need to be supplemented. Firstly, in spite of their comprehensiveness, neither any of the two papers by Tang, et al (2004) and Cervero and Murakami (2009) presented any hypothesis testing of their findings. Secondly, these two scholarly studies were done more than 12 years ago. Since the time of their publication, Hong Kong has been experiencing a number of key events, including social unrest incidents in Hong Kong in 2014 and 2019, the escalating US-China trade tensions and the outbreak of the deadly COVID-19 Pandemic, which might have significant adverse impacts on the global and Hong Kong economies, and probably on the MTR’s business. It is an opportune time to revisit the case and evaluate the business and financial performance of MTR by testing the following two hypotheses, covering the duration of preferably 30 years or more, including the socio-economically challenging period of the last 10 years ending 2021 in Hong Kong:

Null hypothesis #1, (Ho)1: The financial self-reliance of the MTR based upon the R+P infrastructure financing model remains sustainable;

Alternative hypothesis #1, (Ha)1: The financial self-reliance of the MTR based upon the R+P infrastructure financing model is not sustainable.

As a further follow-up study, the five selected railway companies can be divided into two observation groups, the first group of which have been adopting R+P model (i.e. Hong Kong and Japan) and the second group have not been adopting R+P model (i.e. Europe, the UK and the USA). If the results of the hypothesis testing for the first group indicate that statistically, the railway companies in this group can be regarded as financially self-reliant with minimal need for governmental funding, whereas the second group may indicate that the railway companies in this group cannot be regarded as financially self-reliant, the test results may suggest that adopting of R+P infrastructure financing model would be instrumental to the financial self-reliance and resilience. This would provide further supporting evidence that the R+P model can be applied in different jurisdictions with success, implying that it is replicable to other cities.

1.3 Research Objectives

The scope of the study is to conduct an update evaluation of MTR's corporate performance through organization-wide comparative analysis of leading railways companies in the world, including the understanding of their business models and best practices / standards which have been contributing to their success in achieving organizational & social objectives. The focus would be on:-

- (a) the sustainability of MTR's business and financing model through a long period of time (at least 10 years); and
- (b) the replicability of MTR's business and financing model to railway companies in other economies.

2. Research Design

2.1 Definition of Variables

To facilitate a cross-sectional comparative analysis across border, firstly a leading and representative railway company will be selected from each of Asia, Europe, Americas and the U.K. (the first country having a railway) respectively, in addition to Hong Kong, for conducting a detailed analysis of the selected companies on the following key performance indicators:

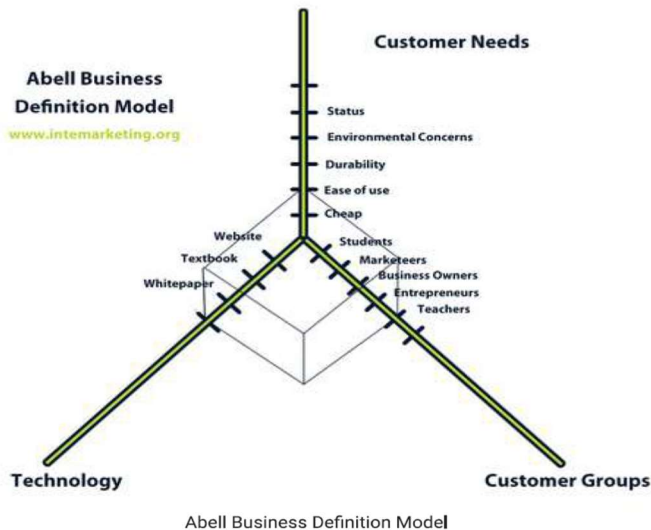
(a) Financial performance and its viability: by observing the below indicators from financial statements and other public information over at least last 10 years, preferably 30 years or more, for the 5 selected companies:

- (i) Revenue from railways and related operations
- (ii) Revenue from non-railways related operations (incl. real properties / hotels, consultancy and operational management services)
- (iii) Operating profit by business segment (from railway-related operations and non-railway-related operations, including property development, management and consultancy services)
- (iv) Variability of the revenue and the total operating profit
- (v) Financial viability by transport-related operations, expressed in terms of cost recovery ratio (i.e. the ratio of operating expenses being covered by the operating revenues)
- (vi) Amount of government funding in each calendar/financial year, if any.

The indicators (v) and (vi) are key items to look at and for more in-depth analysis.

(b) Key operational performance indicators: By adopting the **Abell Three Dimensional Business Definition Model** (Abell, 1980), clear market delineation of current activities of MTR can be identified and the relevant operating performance indicators can be determined:

- (i) **Customer groups** (Who are the target customers?)
- (ii) **Functions** (What are the customer needs?)
- (iii) **Technology** (What tools & procedures are required for producing the desirable product(s) or service(s) for meeting such customer needs?)



The Abell Model can also be applied for explaining the rationale(s) for the changes in corporate strategies in the past and for adapting MTR's corporate strategies to meet the future changes in the market.

2.2 Framework of Relations

Hence, by applying the Abell Model, the customer needs are identified and the key operational performance indicators for measuring the success can be determined, as follows:

Customer group(s)	Customer needs	Key performance indicators (Abell Model)
Commuters	Safe	Incident reports/ deaths & injuries reports
	Reliable	Passenger service on-time performance
	Affordable	Level of fares & charges
	Accessible/easy to use	Barrier-free accessibility; customer information & communication
	Comfortable	Location temperature, air quality
	Efficient	Speedy delivery of service
	Value-added services	Quality of additional services

Similar analysis for other customer groups (e.g. tenants or owners of properties developed or managed by MTR or other selected companies, where applicable) can be conducted using the above method.

2.3 Research Method

The research method is two-fold, namely:

- (a) Cross-sectional comparative analysis of leading and representative railways groups, each being selected from Asia, Europe and Americas, in addition to Hong Kong;
- (b) Longitudinal analysis of the evolution of the business and financial performance of the selected railways companies through a sufficient length of time, say, 10 years or more, preferably 30 years.

As a result of the literature review in Section 1.2 above, a hypothesis testing of the key financial performance indicator (i.e. Cost Recovery Ratio) of each of the selected railway companies would be conducted. The selected companies would be categorised in two groups (one group having adopted R+P model, another group without adopting R+P model) for investigation as to whether any of the two groups would have been enjoying financial self-reliance and demonstrating financial resilience through the time. The results of these two groups will then be compared and other key operating indicators would be used for providing the explanation for the outcome.

2.4 Sampling

- (a) From the Top Ten Railways Groups league tables in terms of market capitalisation and revenue published by a commonly used league table compiler, such as business-to-business sales and marketing platform BizVibe (2022).
- (b) The top one in each of the Asia, Europe, Americas and the U.K., with focus on passenger business, instead of freight carriers.

2.5 Measures

- (a) Revenue Contribution & Operating Profit Contribution by segment:
 - transport-related
 - non-transport-related
 - real property/hotels

- consultancy/operational management
- other businesses (overseas projects)

(b) For non-financial operational performance: obtain data from published reports of the selected companies.

(c) Supplemented by information: from the Community of Metros (“COMET”) Worldwide Urban Railway Performance Benchmarking Report.

3. Data Collection, Analysis & Report

3.1 Proposed Data Collection and Processing

Sources of data (mostly publicly available data):

- (i) published annual reports and financial statements from the five selected companies
- (ii) Environmental, Social and Governance Reports / Sustainability Reports issued by the selected companies
- (iii) Government policy documents/legislative documents
- (iv) Ten-year (preferably covering 30 years) financial and operating result summaries
- (v) Work out the % contribution of revenue and operating income by sources
- (vi) Ridership: no. of passengers on an average weekday & in a calendar year.
- (vii) Patronage of railway ridership as a percentage of the total ridership of all means of transport
- (viii) Gross ticket revenue

3.2 Data analyses

The following data analyses will be conducted for each of the selected companies, focussing on

- (i) Variability analysis of revenue and operating income (noting in particular the secular trend)
- (ii) Cost recovery ratio (CRR): total operating revenues from all business operations (including railway, property-related revenues but excluding government grants, loans, subsidies and other forms of funding) expressed as a percentage of total operating expenses (including interest expenses, capital expenditure, depreciation and amortisation).

Instead of notional amount expressed in local currency, the CRR defined above is selected to facilitate comparison among different railway companies from different parts of the world without the need of currency translation of the net operating income in local currencies.

Hypothesis testing of the CRR measured for each railway company for the last 30 years, using one-tailed t-test with degree of significance of 0.025 (2.5%)

Null hypothesis, $H_0: \mu \geq 1$

(where μ = statistical mean; and the degree of significance $\alpha = 0.025$)

Alternative hypothesis, $H_a: \mu < 1$

The above one-tailed t-test can be conducted using Statistical Products and Service Solutions (“SPSS”) or Microsoft Excel worksheet with statistical analytical functionalities.

3.3 Expected Findings & Recommendations

With its diversification into real property development, leasing and management, as well as non-domestic businesses (transport and non-transport related), MTR of Hong Kong (and also the railway company selected from Japan) should demonstrate that the null hypothesis, H_0 , should not be rejected, which indicates

- a relatively stable level of positive operating income most of the time; and
- financially self-reliant and more resilient through the time

Due to the capital-intensive nature of railways business, low ridership and little revenue contribution from property and other business operations, railways companies in Europe, the UK, the USA and other countries may show heavy reliance on government grants and funding in order to keep the railway companies alive.

3.4 Report and Organization

- Findings
- Analysis
- Conclusions

Further to the hypothesis testing on the Cost Recovery Ratio, other business and operational performance indicators would be used to provide supporting evidence and explanation. As high ridership is one of the contributing factors to the success, the motivation for the potential passengers and the staff of the railway companies may be analyzed or explained with the use of Yu’s Heart-Head-Hand (3H) Holistic Management Framework (2022), given that passenger services are people business.

With the operational and financial data from railways companies based in Asia, Europe, the UK and the USA, it can be evaluated whether the assertion by Tang, et al (2004) relating to the success of the Integrated Rail-Property Development model is unique to Hong Kong, or the business and infrastructure financing model can also be applied to other jurisdictions.

Based upon the data obtained from preliminary research, it is expected that the Rail+Property model is not unique; JR East of Japan, for instance, has also been adopting similar business and financing model for long time and has been profitable most of the time. In case the hypothesis testing for JR East also supports the null hypothesis, H_0 , it can be concluded that the Rail+Property Development model has its merits. In other words, the cash flows generated from property development and related business operations is used to subsidize construction, development and operations of the railway.

4. Potential Contribution, Discussions and Limitation of the Research

4.1 Potential Contribution of the Research

With the updated review of the Rail+Property Development Model with data covering a reasonably long period of time (1992-2021), supported by a hypothesis testing for each of the selected leading railway companies in the world, it can be known for certainty as to whether such model would be instrumental for providing a railway company financial self-reliance and resilience. The testing results from two groups of companies with and without adoption of R+P model may provide further evidences as to whether such model is replicable from one jurisdiction (Hong Kong) to another (say, Japan). Hope this research can contribute to filling up this research gap.

4.2 Discussions

(a) Any good aspects of business models/strategies of other railways companies for replication? For example, the strategies for decarbonisation drive in the run-up to carbon emission peak by 2030 and net-zero emission by 2050.

(b) Knowledge learnt from other leading railway companies and its real-life implications:

- Regional revitalisation by JR East (East Japan Railway Company Ltd. Factsheets, 2022)
- “Society 5.0” (Hayashi, 2020)
- Can the above ideas/knowledge be applied to Hong Kong for implementing its Northern Metropolis Development Strategy?

4.3 Limitations of the study

(a) Comparability of financial data – From exploratory research, it has been revealed that Government grants and funding in certain countries, such as Germany and the USA, may be recognized as “operating revenue” in the financial report of the railway companies! Moreover, there may not be readily available data for the last 30 years for certain countries. Quite often, changes in financial accounting treatment for certain countries during the past 30 years may lead to difficulty in carrying out consistent and meaningful comparison of the figures.

- (b) Breakdown data of revenue and operating income by business segment from some railway companies (such as Germany and the USA) may not be easily available, making it difficult to conduct adjustments to the financial data for direct comparison across borders.
- (c) In case of the need for detailed study of motivation of potential passengers and the staff with the use of the Yu's 3H Holistic Management Framework, it may be recommendable to be treated as another research topic, as the scope of research would involve qualitative research methods such as opinion poll and questionnaire which requires much administrative and manpower support.

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