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Interdisciplinary

Barriers in Implementation

Forest Accounting and Ecological

Highlights

Problems and Prospects of Brand

Ecotourism Potentials, Challenges

Discovering Thoughts, Inventing Future

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Forest Accounting and Ecological Sustainability

By Dr. Patil P. J.

Pune University

Abstract- Forest accounting is creating ground for ecological rationality. World is in danger because of clashes in natural resources particularly ecological ecosystem. There is nexus between forest accounting and sustainable development. Forest is one of the important resources as it is one of the important components of the terrestrial environmental system and larger resource base. Forests provide different basic inputs to the global economic cum ecological system in a multi-dimensional way. It provides timber, fuel wood, pulpwood, fodder, fiber grass and non-wood forest produce & support industrial & commercial activities. They also maintain the ecological balance & life-support systems which is essential for food production, health as well as overall development of human kind.

Keywords: rationality, ecology, ecosystem, forest accounting, india, sustainability, biodiversity, flora, fauna.

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Forest Accounting and Ecological Sustainability

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Abstract- Forest accounting is creating ground for ecological rationality. World is in danger because of clashes in natural resources particularly ecological ecosystem. There is nexus between forest accounting and sustainable development. Forest is one of the important resources as it is one of the important components of the terrestrial environmental system and larger resource base. Forests provide different basic inputs to the global economic cum ecological system in a multi-dimensional way. It provides timber, fuel wood, pulpwood, fodder, fiber grass and non-wood forest produce & support industrial & commercial activities. They also maintain the ecological balance & life-support systems which is essential for food production, health as well as overall development of human kind. Forest accounting is having direct input to ecological ecosystem sustainability in various way such as (1) reducing loss of biodiversity. (2) Mitigate inflated economic production figures. (3) Enable value chain and supply chain accounting starting with net forest produce. (4) Enable Gross National Happiness -GNH calculation that is dependent on forest living and environmental standards. (5) Enable balanced economic growth keeping future economic concerns. (6) Enable balance in regional economic diversity. (7) Safeguard biodiversity (both plant and animal). (8) Assess tradeoff between agriculture and environment preservation exercises (9) assess nature of food safety networks based on area specific nutrition availability and bring economic measures for balanced nutrition in regions. (10) Cause rational international economic and diplomacy dialogues based on hard data. (11) Measure economic sustainability. It means need to change perspective of human being towards ecological system. More rationality must bring while dealing with ecology. Present research work would focuses ecological rationality Therefore forest accounting however following are the specific objectives of present research are as follows

1. To explore relationship between forest accounting and ecological sustainability.
2. To develop theoretical modeling of ecological ecosystem sustainability.
3. To discuss various issues of ecological rationality through forest accounting system.
4. To identified challenges of forest accounting.
5. To suggest remedies for ecological ecosystem sustainability.

The present study is explorative study on ecological rationality and sustainability through developing forest accounting system. Essential data has been collected and analyze to find out present nexus. Forest accounting would definitely contribute in making effective decision for forest ecology. There is need to look after forest accounting is one of the instrument for ecological rationality because it's providing various inputs for rational decision making. It cannot afford forest in danger otherwise society will be in danger. It must be recognized invisible forest ecosystem services and

determined its economic value so that ecological rationality would come in picture.

Keywords: rationality, ecology, ecosystem, forest accounting, india, sustainability, biodiversity, flora, fauna.

I. INTRODUCTION

Natural resources are the real wealth of a nation and every citizen of the country has equal right on it. Among all the resources, forest is one of the important resources as it is one of the important components of the terrestrial environmental system and larger resource base. The forests provide different basic inputs to the global economic cum ecological system in a multi-dimensional way. It provides timber, fuel wood, pulpwood, fodder, fiber grass and non-wood forest produce & support industrial & commercial activities. They also maintain the ecological balance & life-support systems which is essential for food production, health as well as overall development of human kind. Forests control the wealth of adjoining land use system. They also improve the wealth of urban areas. However, there is no proper accounting and valuation system available to tap this very important resource. It is leading big biodiversity loss that may cause to risk of disaster. Natural resources are a part of the wealth of the nation. Natural resources include Agricultural and Land, Water, Minerals and Petroleum, Fisheries and Forests etc. Forest sectors is the second largest land use after agricultural. Forest is one of the parts of natural resources. Natural Resource Accounting is closely related to Environment-Economic Accounting. Natural Resource Accounting (NRA) means a stock of natural resources and changes in them because of natural processes or human use. The rapid industrialization and progressive economic growth in recent years has led to phenomenal environment degradation and depletion of natural resources in India. Literature reveals that the Natural Resource Accounting has been made in many resources except forest areas. For that purpose, it is very essential to undertake accounting work for forest area. In India, forests were playing a significant role in rural industry as well as improve major environment resources. India is a one of the top ten most forest developed countries over the world along with the Russian Federation, Brazil, Canada, United States of America (USA), China, Democratic Republic of the Congo, Australia, Indonesia and Sudan. Along-with India, these top rich countries in forest areas account for 67 % of total forest area of the world'.(India State of

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Forest Report-2011). In India, forest cover improved at 0.22% annually over the year 1990-2000 as well as this forest-cover area grew at the rate of 0.46% per year from year 2000-2010'. (Global Forest Resource Assessment-2010) According to, 'Forest Survey of India-2013 the forest cover increased to 69.8 million hectares by 2012 per satellite measurement. This performance show increases of 5.871 sq. km. of forest covers in last two years'. (State of Forest Report-2013).

II. REVIEW OF LITERATURE

It has been examined earlier studies on forest accounting in order to explore various aspects of it. It supports to understand inter linkages between various factors while making forest accounting.

(1) *Haripriya, Sukhdev, Shinha and Sanyal (2007)* They pointed out that to set out and apply a SEEA based methodology to show the true value of forest resources in India's national as well as state accounts. They study is focused on four components of value creation in forest i.e. timber production, carbon storage, fuel wood usage and the harvesting of non-timber forest products. The study finds that there is need to integrate national resources accounting into the national accounting framework. This is important to generate appropriate signals for sustainable forest management. They conclude that existing measures of national income in India is under estimated the contribution of forest income. The incomes of North-Eastern states in particular are highly underestimated by these traditional (GDP/GSDP) measures. The study has shows that if the limitation of the current data on production and prices are addressed, the income through forest will be much more than the today.

(2) *Ykhanbai (2009)* He has study on measuring and assessing forest degradation in Mongolia. The aim of the study is to collect information and review forest degradation accounting. For the study he used different methods such as degradation (depreciation) method, total rent approach and user cost method. He also studies physical and monetary accounting of forest resources degradation, but he not considers accounting for depletion of forest environmental services. The result of study shows that forest degradation has increased from year by year over the study period. The reduction of forest degradation is due to expansions of economic activity and increased global climate changes. He suggests that there should be improvement in forest resource management policies for the future sustainable development. He concludes that for improvement in situation of national resource degradation the institutionalization and adoption of green accounting produce in the country.

(3) *Harris and Fraser (2002)* They critically examine the natural resource accounting in theory and practices. The prime aim of the study is an extensive review of the

theoretical and applied literature on natural resource accounting is provided. They also study the explaining of the economic theory that underpins natural resource accounting, counseling welfare and sustainability of the policy goals. In the study they present various different concept of national income. They found that there is fundamental difference in economic and national accounting methodology. Lastly they conclude that data shows the insufficient attention paid by economist to the revision to the SNA. Furthermore they suggest that there should be use of growth theory model to solve particular technical problem.

(4) *Parikh and Ghosh (1995)* Pointed out that the natural resource accounting for soil to estimate costs of soil degradation for India. They have analysis the soil resource as an empirical estimation of the cost of soil degradation by using the soil quality index for the measure states in India. According to the researcher soil productivity is a function of measurable soil properties/assets. They conclude that the loss in soil productivity consequently affect to the soil degradation due to the soil salinization.

III. PROBLEMS TO BE STUDY

Forest is playing a significant role in balance of natural resources. The global concern about forest degradation and depletion is related to two main problems i.e. destruction of the carbon sinks affecting the global climate and extinction of species affecting the biodiversity. In this context, it is relevant to study forest accounting. These issues raise some problematic statements in the researchers mind, such as;

- No proper accounting for forest resources in the Systems of National Accounts (SNA).
- Management cannot understand the actual forest assets in areas.
- Problems of awareness and knowledge about the forest service in the people and society.
- Lower flow of goods and services in forest products.
- Lower income from goods and services produced by forest area.
- Lack of availability of fodder and reduction in productivity of livestock population.
- Lack of awareness about natural resource economics in terms of forest.
- Lack of proper valuation methodology of forest resources.
- Lack of investment in forest sector.
- Lack of awareness about business opportunity in forest sector.
- Issue of remunerative pricing.
- Value additions in forest produce-bamboo, jute, wool, etc.
- Agro forestry Interfaces.
- Trade Offs in agriculture and environment
- Biodiversity valuation

- Nutrition issues in forest product.
- Measure biodiversity loss and risk of disaster

There is no proper or scientific way of accounting for forest area that create many problems in management of forest resources and hence it's not showing its impact on biodiversity and economy.

IV. OBJECTIVES OF THE STUDY

Present research work would focuses ecological rationality Therefore forest accounting however following are the specific objectives of present research are as follows

1. To explore relationship between forest accounting and ecological sustainability.
2. To develop theoretical modeling of ecological ecosystem sustainability.
3. To discuss various issues of ecological rationality through forest accounting system.
4. To identified challenges of forest accounting.
5. To suggest remedies for ecological ecosystem sustainability.

V. HYPOTHESIS

The following are the specific hypothesis of the study.

1. India need to make forest accounting that will influence Indian bio-economy.
2. Forest accounting could be helpful for making ecological sustainability.

VI. RESEARCH METHODOLOGY

The present study is descriptive study and mainly depends on secondary sources of data. It will collect from different sources such as

Published Sources: The researcher will collect the data from sources such as Directorate of Economics and Statistics (DES), Forest Department Government of Maharashtra, Administrative Report of Forest Department, Forest Survey of India, National Sample Survey of organization (NSSO), Central Statistical organization (CSO) and also Books, research papers published in the Journals, Articles and different Websites etc.

Unpublished Sources: Ph.D Theses, M.Phil Dissertations and other unpublished sources.

VII. FOREST ACCOUNTING

It Forest accounting is multi-disciplinary area including Mathematics, Physics, Life Sciences, Chemistry, Statistics, Accounting and Finance, and economics etc. Therefore it is necessary to look after different parts of it. There are various parameters on which forest accounting system could be developed. Exploration of these all parameters would give clear picture of forest accounting in better way. It is a

challenge to developed forest accounting since it involve complex ecosystem and its invisible services to society. Forest accounting is countering the nature's services especially forest and conversion of its in economic value. It is essential to develop mechanism that will include value of all economic contribution of forest and linked to economy. There are parameters are need to be consider while making forest accounting are as follows;

Actual / Economic Accounts: Following are the economic parameters of forest accounting.

a) Physical Accounting: Physical accounting refers to "the natural resource and environmental accounting of stocks and changes in stocks in physical (non-monetary) units". e.g. weight, area or number. Qualitative measures expressed in terms of quality classes, types of uses or eco-system characteristics, may supplement quantitative measures (Statistic New Zealand, 2002). Forest resources stock is changing every year.

b) Monetary Accounting: Monetary accounts refers to "the entries correspond to the physical accounts but contain an additional entry for revaluation, which records the change in asset value due to changes in prices between the beginning and end of the period, (Statistic New Zealand, 2002).

c) Forest Flow Accounts: Forest flow accounts, include supply & use tables for detailed forest products (wood & non wood, marketed & non-marketed) by sector, which are linked to the input - output (I/O) and also include measures of forest eco-system services, environmental degradation associated with forest use, (Statistic New Zealand, 2002).

(II) Financial Performance: While measuring financial performance following two parameters could be used.

1. Income: Forest department has getting revenue form forest in different ways such as rent of land under temporary cultivation, fees on duplicate permits, sale proceeds of licenses to catch hawks, sale proceeds of condemned tents, furniture and other stores, livestock, tools and plants etc, While evaluating financial performance of forest department aggregation of all income which is coming from forest need to be consider.

2. Expenditure: Forest department need to make various expanses in order to maintain forest such as plantation, protection of forest, salaries and wages of forest staff, harvesting, organization, improvement and extension of forests, livestock, stores, tools and plants etc. Aggregations of these all expanses would be minus from the revenue of the forest department.

(III) Ecological Classifications: For forest accounting ecological classification is must following are these some parameters which are used for it.

1. Legal Classification of Forests: It is important to understand forest in legal sense. Interpretation of what constitutes forest and to distinguish forest from other land uses is essential. (D.Venkateswarlu). In India there are two acts dealing the issues of forest i.e Indian Forest Act 1927, and Forest Conservation Act 1980. It is necessary to taken into consideration as forest those things come under the preview of forest otherwise it would not show correct picture. Identification of forest resources must be under the ambit of law. It is essential for doing forest accounting in fair manner.

2. Forest Types Wise: Forest type is a group of forest ecosystems of generally similar composition that can be readily differentiated from other such groups by their tree and under canopy species composition, productivity and/or crown closure. (D.Venkateswarlu). Forest valuation is depends on type of forest especially tree species, its utility, availability and its demand etc. These issues are matter for making forest accounting because it do impact on economic transactions.

3. Species Wise: Forest is just not tree there are various things involve in it. Hence in forest accounting has to take care of these all visible and invisible matters. Forests are home to 80% of the world's terrestrial biodiversity. These ecosystems are complex webs of organisms that include plants, animals, fungi and bacteria. Forests take many forms, depending on their latitude, local soil, rainfall and prevailing temperatures. Coniferous forests are dominated by cone-bearing trees, like pines and firs that can thrive in northern latitudes where these forests are often found. Many temperate forests house both coniferous and broad-leaved trees, such as oaks and elms, which can turn beautiful shades of orange, yellow and red in the fall. (WWL). Its challenge to make forest accounting because of economic invisibility of nature and its impact on society. Species wise valuation of forest would differ.

4. Fauna and Flora Wise: India has a rich diversity of flora and fauna. Flora refers to plant species and fauna refers to animal species. The term biota includes both plant as well as the domesticated and wild species of animals. There are over 45,000 plant species and 81,251 animal species. It represents about 7% of world's flora and 6.5% of world's fauna. Plants are the main source of food, fodder and other useful things such as fuel (fire wood), fibre, timber, medicine, gums, tannin etc. The Indian fauna includes variety of animal life such as mammals, birds, reptiles, fishes, insects etc i.e. about 800 species of mammals, 2000 species of birds, 420 species of reptiles, 2000 species of fish, 50,000 species of insects, 4000 species of molluscs (Source K.C.Agarwal, 1998). Forest is the base of biodiversity which include flora and fauna. It exits because of forest. It has its own tremendous socio-economic contribution to society. Therefore this parameter is very important

while making forest accounting which need to be taken in perspective.

5. Forest Product Wise: A forest product is any material derived from forestry for direct consumption or commercial use, such as lumber, paper, or forage for livestock wood. It used for many purpose such as wood fuel or the finished structural materials used for the construction of buildings or as a raw material, in the form of wood pulp that is used in the production of paper. All other non-wood products derived from forest resources, comprising a broad variety of other forest products, are collectively described as non-timber forest products. (Encyclopaedia). Thus forest is home of various products which has great economic value. Therefore potential of forest producing of such product and availability of such product would be one of the essential criteria for determining economic value of forest. Its output coming from forest in the form of product which would be useful to society. Forest accounting is considering all forest products and its economic value.

(IV) Forest Valuation Methods: There are various forest valuation methods such as follows.

1. Historical Cost Method: value of a forest is determined by summing up all the accrued investment, management, and operating costs. Basic approach consists in considering the costs that have effectively incurred since the acquisition of the forest e.g. historical cost method. (Samuel Wagniere, 2011). In this forest valuation technique historical cost is taken as base for forest resources valuation.

2. Market Price Method: Determining the value of a forest is by summing up all the accrued investment, management, and operating costs on the basis of the costs that would accrue in case the forest had to be established under current market conditions again e.g. current market price or replacement cost. Value of a forest from current observable market prices (Samuel Wagniere, 2011). In this forest valuation technique current market price of forest resources is taken into consideration for valuation.

3. Discounted Cash Flow Method: A discounted cash flow (DCF) is a valuation method used to estimate the attractiveness of an investment opportunity. DCF analysis uses future free cash flow projections and discounts them to arrive at present value estimate, which is used to evaluate the potential for investment. If the value arrived at through DCF analysis is higher than the current cost of the investment, the opportunity may be a good one (INVESTPEDIA). In DCF calculation of forest starts with an inventory of the current forest stand, followed by the determination of the marketable forest products that will provide future cash flows. After that it follows a projection of the future yields of the forest with regards to the determined products and the forecast of

the net cash flows based on cost estimations and revenue estimations. The final step is the discounting of the net cash flows to the present, using an appropriate discount rate (Samuel Wagniere, 2011). DCF is providing more reliable result and at present it most accepted method of forest valuation used by experts. Of course there challenges in this method like finding appropriate discount rate however it is used widely.

4. Real Option Pricing Methods: It is also often termed real options analysis, (ROV or ROA) applies option valuation techniques to capital budgeting decisions. Real option itself, is the right but not the obligation to undertake certain business initiatives, such as deferring, abandoning, expanding, staging, or contracting a capital investment project (Samuel Wagniere, 2011). It is found that ROP models are applied to the domain of forestry in which the option constellation is provided by a forest property to the forest owner.

5. Sensitivity Analysis: A sensitivity analysis is a technique used to determine how different values of an independent variable impact a particular dependent variable under a given set of assumptions. This techniques is also useful in forest valuation because parameters of forest valuation is most sensitive such as prices of the forest products and the discount rate, length of the rotation , growth and yield assumptions, or the presumed management regime of the forest, (Samuel Wagniere, 2011). In this valuation techniques sensitive factors of forest resources are taken into consideration for valuation.

(v) Forest Economics: Following are the parameters could be useful to understand forest economic in great detailed.

1. Forest Resources: It means the various types of vegetation normally growing on forestland, the associated harvested products and the associated residue, including but not limited to brush, grass, logs, saplings, seedlings, trees and slashing. (Encyclopaedia). Forest is rich of various valuable resources. Economics of forest resources is very strong. Forest accounting must include all the forest resources and its cost benefit analysis. It will help to understand contribution of forest resources in mainstream of economy.

2. Goods and Services: Forest produce significant products such as paper, plywood, sawnwood, timber, poles, pulp and matchwood, fuelwood, sal seeds, tendu leaves, gums and resins, cane and rattan, bamboo, grass and fodder, drugs, spices and condiments, herbs, cosmetics, and tannins. (Encyclopaedia). Along with that forest produce various invisible ecosystem services such as climate regulation, water regulation, pollution control, biological control, pollination, hazardous control, biodiversity and soil erosion etc. These all goods and services has tremendous economic value

and significant contribution in economy. In forest accounting goods and services is major component to be considered.

3. Business: Forest is significant rural industry. It has tremendous potential of business such paper mills, fodder industry, food processing, medicine, saw mills, furniture, crafts etc. Thus business potential of forest is significant factor in forest accounting,

4. Employment: Forest generate huge employment to poor people. Millions and millions of people and animals are directly depends on forest. They are getting their livelihood from forest. Therefore employment generation from forest is also one of the important aspects of forest accounting.

Above mentioned forest accounting parameter would definitely helpful for developing good forest accounting system. However only these parameters are not sufficient need to make further investigation. But these parameters would give good ground for making forest accounting.

VIII. CHALLENGES OF FOREST ACCOUNTING

It is very significant to make forest accounting. However it is difficult task. Following are the challenges emerges in forest accounting.

(1) Identification of Biological Assets: Identification of biological assets in forest accounting is real challenge. Biological assets produce invisible economic ecosystem services. It support life system. They are hidden and versatile like microorganism and hence it very difficult identified.

(2) Valuation of Biological Assets: After identification of biological assets needs to make valuation of it. However, there is no systematic and perfect method exists for making valuation of such biological assets.

(3) Measurement of bio-diversity Loss: Important component of forest accounting is identification and measurement of biodiversity loss. Again there is no fixed standard available which measure biodiversity loss in monetary terms.

(4) Compensatory Value: Again identifying the compensatory value of ecosystem services is difficult. There is no perfect methodology available for compensatory value for nature services.

(5) Availability of Data: There are lot of complexity and greyness in data related to forest resources and forest ecosystem. Unavailability of data leads to limitation in making accurate analysis and interpretation.

(6) Internalization of Externalities: Forest resources and forest ecosystem is versatile phenomena on which external and internal aspects made impact. In forest accounting internalization of externalities is a problem. Because there is no standard methodology available for assessing the impact of externalities in monetary terms.

Generally these above mention challenges are dealing by researchers in natural resources accounting. It is difficult to resolve because it involves various invisible services which is difficult to quantified and assigned value. However these all services has economic value.

IX. FOREST ACCOUNTING AND BIODIVERSITY

Forest biological diversity is a wide term that refers to all life forms found within forested areas and the ecological roles they perform. As such, forest biological diversity encompasses not just trees, but the multitude of plants, animals and micro-organisms that inhabit forest areas and their associated genetic

diversity. Forest biological diversity can be considered at different levels, including the ecosystem, landscapes, species, populations and genetics. Complex interactions can occur within and amongst these levels. In biologically diverse forests, this complexity allows organisms to adapt to continually changing environmental conditions and to maintain ecosystem functions (CBD).The significant contribution of forest accounting is of helping to maintain biodiversity. There is strong nexus between forest accounting and biodiversity. Forest accounting explores different services provided by forest to biodiversity and measure its impact on it.

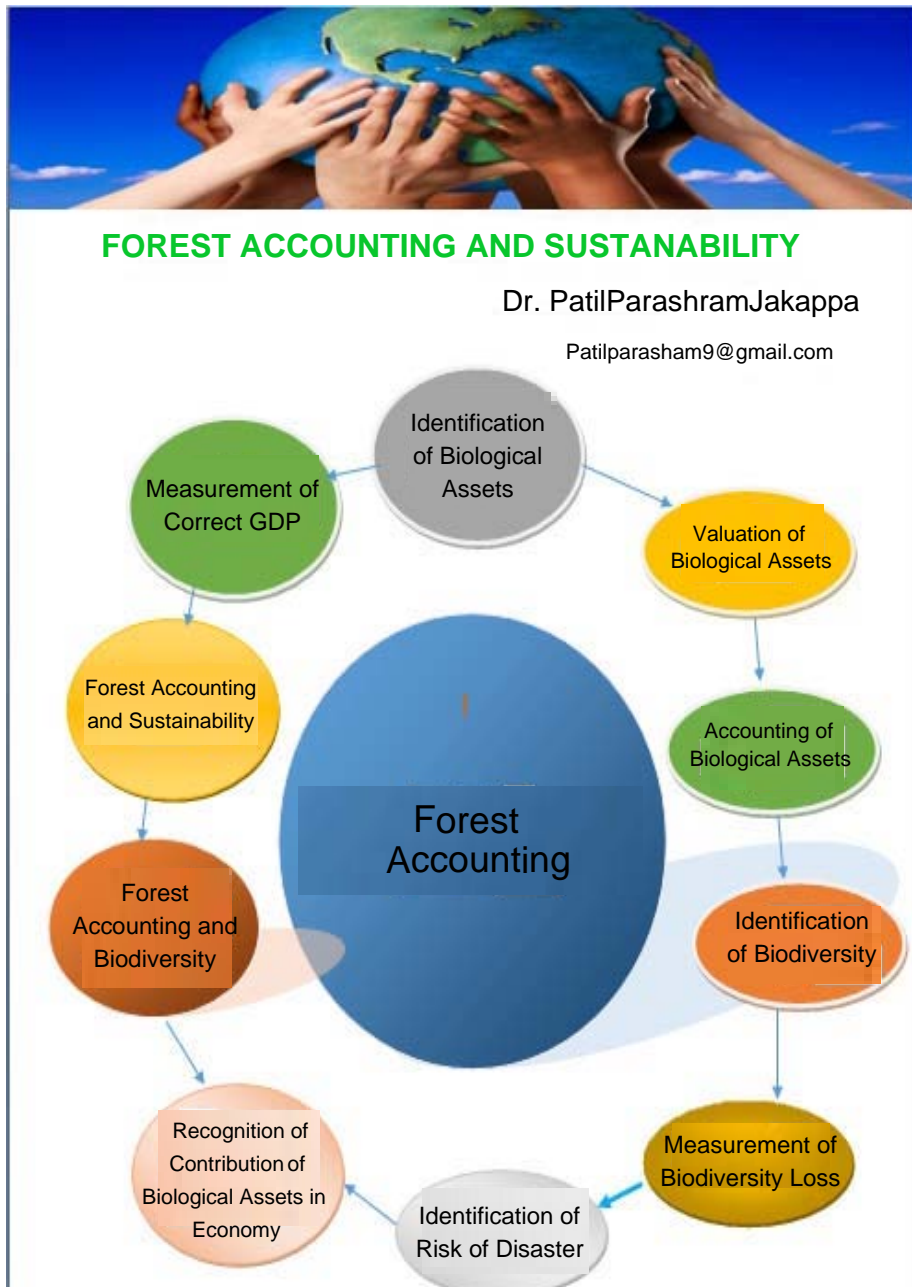


Figure 1: Theoretical Model

(1) *Climate*: Forest is giving significant input for climate regulation and it is essential for biodiversity. Forests are the only major ecosystems where the amount of carbon stored in biomass of the plants exceeds that in the soil; deforestation therefore also affects climate regulation (Elmqvist et.al 2011). These services are provided by forest free of cost. It needs to be taken into consideration in forest accounting. Climate change cost to economy, to reduce down that effect forest accounting would help in great extent. Identification of these forest services to climate regulation and quantification of it in monetary value would be concrete steps in understanding and preserving biodiversity in long run.

(2) *Water*: Forest services are playing major role in maintaining water cycle without this water regulation would not be possible. Forest and wetlands with intact groundcover and root systems are considered very effective at regulating water flow and improving water quality (Elmqvist T et.al 2011). Water is essential component of biodiversity preservation. Again forest services for water regulation are invisible not counted in monetary value. It can be quantified and find economic value of it so that forest services could be recognized. It shows nexus between forest, water regulation and biodiversity.

(3) *Biological Control*: The loss of biodiversity can be attributed to deforestation that effect on biological process. Forest protects biodiversity in terms being home of species of flora and fauna. It has their own biological process depends directly and indirectly on forest.

(4) *Erosion prevention and hazard control*: Vegetation cover is the key factor for preventing soil erosion (Elmqvist T et.al 2011). Forests protect against landslides by modifying the soil moisture regime (Sidle et al. 2006). Thus forest services are directly contribute in erosion prevention and hazard control which essential for biodiversity and sustainability. Accounting of forest ecosystem services recognize value providing to society by forest.

(5) *Pollution Control*: Forest play multiple roles when it comes to local air pollution. Trees in general help to reduce air pollution, including absorbing the greenhouse gas carbon dioxide, some species contribute to local smog by emitting volatile organic carbons (VOCs). Planting locations of individual trees and species selection make a difference in the overall pollution balance. (Melanie Lenart, 2015). Forest is essential component for reduce down pollution in urban as well as in rural area. These forest services which absorb carbon dioxide are directly contribution in biodiversity and sustainability.

(6) *Pollination*: One of significant forest services is Pollinators. It is responsible for assisting over 80% of the

world's flowering plants. It provide food to humans and animals without which it is not possible to meet food demand. It is an essential ecological survival function. Without pollinators, the human race and all of earth's terrestrial ecosystems would not survive. (USDA). For quantification of pollination services in monetary value is necessary to in forest accounting. Pollination is promoting biodiversity.

(7) *Biodiversity Loss*: Forest accounting using different parameters measure the loss of biodiversity. Identification and quantification of actual biodiversity loss would help to make concrete policy making to reduce down biodiversity loss. Therefore for the biodiversity preservation forest accounting could be used as one of the instrument. Unless identification and measurement of biodiversity loss one cannot make prevention action on it. Forest accounting would tell the loss of biodiversity.

(8) *Trade off in Agriculture and Environment*: Impact of undesirable tradeoff could be assessed through forest accounting. 35% of the Earth's land surface is used for agriculture growing crops or rearing livestock (ML 2005). Due to repaid industrialization and agriculture trade off in agriculture and environment is become complex issue. It is badly making impact on biodiversity. Forest accounting would help to assess trade off situation.

(9) *Risk of Disaster*: Forest has a significant role in reducing the risk of natural disasters, including floods, droughts, landslides and other extreme events. At global level, forests mitigate climate change through carbon sequestration, contribute to the balance of oxygen, carbon dioxide and humidity in the air and protect watersheds, which supply 75% of freshwater worldwide (SDNF). Natural disaster cause huge biodiversity loss and damage to ecosystem that make negative implication on economy. Forest accounting would help to identified risk of disaster.

(10) *Sustainable Development*: The practices of sustainable development are biodiversity friendly. Forest ecosystem services are supporting sustainable development by regenerating ecosystem. Forest himself shows various ways of practicing sustainable development. Forest accounting would also help in sustainable development.

Thus forest accounting is given significant input in various ways such as protecting biodiversity, sustainability, protection of ecosystem, livelihood, economic development, industry and trade, employment generation, reduction of biodiversity loss, risk of disaster, true measurement of economic development, and generating accurate data for policy makers etc. In present context bio economics is getting significant importance in national policy making. It intends that forest accounting practices are inevitable in economy because green economy would be the future. Therefore it is in great interest of society that forest

accounting would come as one of the major field of study.

X. CONCLUSION

In India forest sector is the second largest land use after agricultural sector. The forest helps in maintain of ecological balance in environment. Forest accounting is helpful and important for maintenance of natural resources in forest in a proper way. It is also helpful to make monetary accounting of forest resources. It is important to the management of forest area and understanding the availability of natural assets and income earned from this asset. It will show importance of natural economics and different method of valuation of natural resources. This study is also helpful to societies and industries dependent on forest product. They can understand and be aware about the forest resource they used for their own purpose. The forest is beneficial to agricultural system and plays an important role as foster mother in promoting agro industrial economy. Forests made significant contribution to Indian economy and to the state domestic production. However following are the specific advantages of forest accounting (1) To reduce loss of biodiversity.(2) To mitigate inflated economic production figures.(3) To enable value chain and supply chain accounting starting with net forest produce.(4) To enable Gross National Happiness -GNH calculation that is dependent on forest living and environmental standards.(5) To enable balanced economic growth keeping future economic concerns.(6) To enable balance in regional economic diversity.(7) To safeguard biodiversity (both plant and animal).(8) To assess tradeoff between agriculture and environment preservation exercises(9) To assess nature of food safety networks based on area specific nutrition availability and bring economic measures for balanced nutrition in regions.(10) To cause rational international economic and diplomacy dialogues based on hard data.(11) To measure economic sustainability. Hence it is need to make in depth theoretical analysis of forest accounting. It is an instrument to understand eep biodiversity loss of ecosystem services and identified the risk associated with it sot that potential disaster could be prevented. Thus it is significant to look at sustainability by making proper forest accounting, it will definitely make difference.

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The Campaign on Facebook for the 2016 Roman Administrative Election from a *Mixed-Methods* Perspective: The M5S/PD Face-Off

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Abstract- While the internet offers up great masses of both textual and numerical data that can be analyzed using the automatic features of powerful software programs, this does not on its own represent a viable work strategy. The wealth of available data should in fact mark the beginning of a varied and complex process of research and analysis that looks to combine a plurality of investigative tools and techniques, both traditional and of the latest generation. The presentation here of the key findings of an empirical investigation offers an opportunity to highlight the advantages of a mixed-methods approach.

Keywords: facebook, electoral campaign, mixed-methods research, 5 star movement, democratic party.

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Loris Di Giammaria ^α & Maria Paola Faggiano ^ο

Abstract- While the internet offers up great masses of both textual and numerical data that can be analyzed using the automatic features of powerful software programs, this does not on its own represent a viable work strategy. The wealth of available data should in fact mark the beginning of a varied and complex process of research and analysis that looks to combine a plurality of investigative tools and techniques, both traditional and of the latest generation. The presentation here of the key findings of an empirical investigation offers an opportunity to highlight the advantages of a mixed-methods approach.

The Roman administrative election in the spring of 2016 was the object of an articulated program of research. This paper will focus on the methodological choices and results obtained regarding the electoral campaign conducted on Facebook by the mayoral candidates – Raggi of the 5 Star Movement (M5S) and Giachetti of the Democratic Party (PD) – up to the time of the vote itself. The research goals are: the reconstruction of the procedures followed by these political actors in their electoral campaigns; the definition of the role of social networks, Facebook in particular, in this context; the examination of the tone, content, and communicative style of the leaders in the campaigns; the analysis of the reactions, sentiments, comments and endorsements in the online interactions and relationships of the most frequent web users.

Keywords: facebook, electoral campaign, mixed-methods research, 5 star movement, democratic party.

I. OBJECTIVES OF ANALYSIS AND INSTRUMENTS UTILIZED

Digital technology and the internet are now able to furnish great masses of data, in the present instance textual data bases, which can be analyzed by means of automatic features built into the powerful software programs. These do not, however, represent a viable work strategy on their own. The wealth of available data should in fact mark the beginning of a varied and complex process of research and analysis that seeks to combine a plurality of investigative tools and techniques, both traditional and of the latest generation (cf. Di Giammaria and Faggiano, 2016 and 2017; Amaturò and Punziano, 2016). The presentation here of the key findings of an empirical investigation offers an opportunity to highlight the advantages of a mixed-methods approach.

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The aim of the paper is to focus on the methodological choices and results obtained with regard to the electoral campaign conducted on Facebook by the mayoral candidates – Raggi of the 5 Star Movement (M5S) and Giachetti of the Democratic Party (PD) – up to the time of the vote itself (Biorcio e Natale, 2013). Our purpose is to highlight the advantages of the process followed, which is undoubtedly adaptable to other themes and to research contexts that, like the one presented here, feature: 1. a social media network as a context for the observation and sampling of textual information; 2. abundant textual material covering a significant period of time; 3. the aim of using multiple and complementary lenses to identify and explore not only the lexicon and the prevailing themes and sentiments, but also relationships, interactions and decision-making processes.

Research objectives include: the reconstruction of the procedures followed by the political actors in their electoral campaigns; the definition of the role of social networks, Facebook in particular, in this context; the examination of the tone, content, and communicative style of the campaign leaders (Giglietto, 2015; Boccia Artieri, 2015); the analysis of the reactions, sentiments, comments and endorsements in the online interactions/relations of the most frequent web users (Pira, 2012).

The investigation considered all the web posts submitted by the candidates on their own public Facebook pages during the course of the entire electoral campaign (346 in total, of which 149 from Giachetti and 197 from Raggi). The empirical base also included the set of comments on these posts (more than 170,000, a volume of around 2,000,000 occurrences). The finalized research design sought to select, for each level under investigation, the tools and techniques that would be most suitable and fruitful for the purpose of obtaining interesting and reliable results. This involved oscillating between extensive analysis over the entire data set, automatic and semi-automatic analysis of the big textual corpus, and the hermeneutic analysis of significant portions of texts selected *ad hoc* (Faggiano, 2016). Specifically, for both the messages from the politicians in the field and the reactions to them from the voters, we can include as recognizably complementary the following choices: 1. Survey analysis of contents; 2. Hermeneutic analysis of the text; 3. Semi-

automatized analysis of a big text corpus; 4. Analysis of conversations.

As mentioned, Facebook, in close connection with Twitter and with other internet channels in a broader sense (Faggiano and Nobile, eds., 2016) represented the main context of the campaign, carrying an incisive selection of content and messages from the traditional media (radio interviews, clips from TV shows, excerpts from news programs, newspaper articles, etc.). The campaign under analysis may be classified as exceptional for a number of reasons, including the condition of distress and decline of the city, the widespread and exponential rise of a new political force, the particular nature of the parties/movements that reached the finishing sprint, and the social/demographic (age, gender) and cultural (political background) characteristics of the candidates in the field.

The web postings analyzed are those submitted over the course of four weeks, the two leading up to the first electoral date (5 June 2016) and the two that preceded the runoff between Raggi and Giachetti (19 June 2016). Giachetti submitted 70 posts between 23 May and 5 June, and 79 between the 6th and 19th; Raggi, on the other hand, posted 111 times in the first two-week period and 86 in the two that followed. In percentages, Raggi submitted 57% of the posts under analysis and Giachetti the remaining 43%. Even though Raggi submitted more posts than the PD candidate, both in absolute numbers and percentage, her productivity declined with time while Giachetti's increased (61.3% vs 38.7% in the first part of the campaign; 52.4% vs 47.6% in the second). The tone and communicative style, content of posts, and mode of use of the platform were systematically analyzed for each candidate and phase of the electoral campaign.

The analyses undertaken, aimed at bringing out the distinctive characteristics of the two mayoral candidates, allowed us to outline more than a few common notes regarding plans for setting "priorities for the city" (for example, similar solutions concerning the problem of mobility and road safety, the recovery of the city's historical and cultural heritage, etc.). The clearest differences that came out concern the tone, the communicative style and the use of the platform. The only thematic front on which the candidates were directly opposed is the question of the 2024 Olympics, with Giachetti in favor of Rome's candidacy and Raggi opposed. The second part of the campaign, swirling round this core theme which became the battleground for open confrontation, was progressively empty of content and embittered in tone. All this worked in favor of Raggi, who was probably seen by the voters as more composed and coherent than her opponent.

As mentioned, in addition to the posts, the analysis considered all the comments on them as well, representing a data base of huge proportions. The section that follows is an account of the predominantly

quantitative approach followed in the analysis of the posts and comments¹ (survey analysis of post contents, statistical/textual analysis of the comments), while the third and fourth sections describe the qualitative analysis of the conversations that developed around the posts. The sole function of the framework utilized is to lend order and coherence to the discourse, to offer the reader a linear representation of a synergistic and complex process of inquiry in which quality and quantity were equally fundamental in producing the results.

II. THE CONTENT OF THE CAMPAIGN: FROM THE CANDIDATES' POSTS TO THE ELECTORS' REACTIONS

The survey analysis of the contents yielded interesting results as regards the following issues: the frequency of use of the platform by the candidates, the style of posting, statistics concerning reactions to the posts (by quantity and type), the intensity of propagation of posted content on the web through the "sharing" function. Apart from a certain alignment along the mean of the number of daily comments on the posts, all the average values for Raggi far outpace those observed for Giachetti (cf. Morcellini, Faggiano and Nobile, 2016 for the actual data). Comparing the extreme values for each indicator the differences between the candidates are even more striking:

- *min* 0-*max* 15 for Giachetti and *min* 1-*max* 25 for Raggi on number of posts;
- 1327-17734 for the PD candidate *vs* 3266-79391 for Raggi on "likes";
- 1345-18383 for Giachetti *vs* 3328-82903 for Raggi on total reactions;
- 389-12857 *vs* 426-10935 respectively on comments;
- 216-5659 *vs* 809-37506 on "shares".

Raggi, in addition to being more present and especially more visible on Fb, also stimulated a higher level of participation. The figures for reactions and for the volume of 'shares' speak clearly, although it should be noted that the reactions the candidates get may also be negative. It should also be pointed out that by tradition supporters and activists of the M5S use the internet on a particularly regular basis to discuss/inform/mobilize, and not only in exceptional circumstances like the electoral campaign. Having taken these distinctions into account, the fact remains that Raggi was the real star of Facebook during the electoral campaign and, by exploiting it in a more lively and active way she had a greater web response than her opponent. With respect to posting style it can be said that the extensive use of photographs, generally accompanied by a brief written text (for example, showing Raggi and Giachetti casting

¹ We have deliberately avoided excessive indications of numbers and percentages. For precise details of this type see the full research report (Morcellini, Faggiano, Nobile, 2016).

their votes), figures at just over 42% for both politicians (which remained stable from one phase of the campaign to the other). The most striking difference, on the other hand, is that Raggi posted videos in more than half the cases, as compared with just over 30% for Giachetti. This is the most structurally complex kind of posting: words, hashtags, and links are accompanied by a video, as a rule originally designed, shot and edited for the occasion (for example, the live phone call from Grillo during an event at Piazza del Popolo or the live toast by Giachetti with a glass of wine on the eve of the election).

What emerges, then, is a more skillful and effective use of the platform by Raggi, compared with the more traditional and static style of Giachetti who, rather than writing a post on an online blackboard, sometimes seemed to be presenting a staged speech (indeed, he wrote fewer posts but used more words overall than Raggi).

Giachetti appears, moreover, less dynamic than Raggi in the transition from one phase of the campaign to the other. Even while varying the targets, themes and registers, the statistics for his posting activity remain stable over time, and the figures are systematically lower than those of his adversary. Raggi's campaign, on the other hand, records forms of increased consensus, visibility and dissemination of content that can be interpreted as pointing toward greater effectiveness in online political communication. With respect to all the statistics on the posts (likes, comments, shares, etc.) the values for the index of variability are consistently high and in any case differentiated, as if to say that the incisiveness and success of a post are strongly associated with its form and its specific contents.

The mayoral candidates of the PD and M5S often pass from a courtly register, sometimes rhetorical (Giachetti: "I dream that our Capital might once again bask in its own light, like the newly glowing travertine of the Colosseum at twilight"; Raggi: "It takes courage ['coRAGGlo' in Italian] to change Rome"), to the use of slang expressions in Roman dialect, aimed at highlighting the identifying feature of being Roman and their own link to the local area.

The candidates use a simple and direct lexicon to articulate their short- and long-term objectives for the city, speaking of the right to housing, of cultural events and even of potholes in the streets. On the question of what they will actually do for the city in terms of concrete goals, they employ modulated tones and the most positive forms of expression, and this in a campaign that is otherwise decidedly toxic. The examples below are posts that refer to plans of action (regarding schools, waste disposal, major work projects, tourism, etc.) and specific key social categories (youth, women, seniors, migrants, etc.)

Raggi:

Here is our program for a city without suburbs: [#coRAGGlo](http://m5s.info/-periferie). A new kind of urban planning for Rome: calling a halt to urban expansion, preservation of what remains of the Roman countryside and new rules to bring back the inhabitants we have lost. (...) Social exclusion is not fought using the police force but with the recovery of civil dignity in a city that needs to be turned upside down: from the center to the suburbs.

Giachetti:

The planned stadium for La Roma [the football team] doesn't just concern the fans or lovers of football; it involves all Rome's citizens, especially those who live or work in the Tor di Valle area. This project calls for the reclamation of the area, the creation of a natural park as big as Villa Borghese, completely covered by video-surveillance, with over 400 million in investments for the urbanization of the area. All of which will be done privately. Rome must once again attract private investment, not push it away as it has done for too many years.

For the posts of both candidates a few simple interpretive keys are applicable which may be represented using a series of opposing semantic poles: "past/future", "heritage/planning", "myself/others", "saying yes/saying no", "stagnation/transformation".

Raggi tends more to speak of "us" and of M5S more generally, while Giachetti speaks substantially in the first person. In addition, Raggi defines the political movement she belongs to as the only antidote to the misconduct that went before, the only way to bring honesty, citizen participation and transparency to the city. Giachetti presents himself as someone who wants to keep dreams alive in grand style (the 2024 Olympics, the new football stadium), a man free of constraints, honest, competent, and passionate about politics.

Then comes the harsher group of analyzed posts, those expressing the candidate's intention to defeat the other. In Giachetti's case these are directed at a specific person, Raggi, who is labeled in the most strongly worded messages as "a liar", "led by others", "remote-controlled", "she who says 'no'", "one who ducks confrontation", "symbol of populist degeneracy"; and in Raggi's posts at an entire political class, a general *modus operandi* and, essentially, a good part of Italian political history.

The analysis of words and key expressions led to an accurate reconstruction of the most frequently invoked elements of the campaign: themes, actors, communication recipients, program points, other media (social and traditional).

In a nutshell, if the first phase of the Giachetti campaign shows a predominance of positive content (principles, goals for the city, concrete actions), all this is pushed to the back burner in the second phase, and is

almost completely overshadowed by the theme of the 2024 Olympics and the need to defeat the enemy. Raggi, on the other hand, even while making constant and harshly critical comments about the old politics and the old parties, has no time for Giachetti, to whom she remains substantially indifferent. Raggi's emphasis is on change, the M5S, Rome and its citizens. This plays out against a backdrop of appointments and events, media contexts in which the Movement's campaign messages are delivered and which serve as an incentive for the donations which are the only economic support for the M5S's "low-cost" campaign.

In concluding the section on the analysis of the posts, it may be said that Raggi played the campaign game more skilfully and productively. The statistics from the analysis of the social media offer a glimpse of this and it is reflected not only in the election results, where the position of protest (in both the vote and the non-vote) carried the most weight, and in the urgent attention to local needs, but also in the way the campaign was conducted in terms of persuasiveness and of the broadening and strengthening of consensus.

With regard to the comments on the posts and specifically, for the moment, to the findings of the quantitative analysis, our questions concerned the nature of users' emotional reactions to the posts of Giachetti and Raggi, which of the topics introduced by the two leaders sparked the most lively debates, and what these consisted of in terms of content. As mentioned in the introduction, the corpus is massive: more than 170 thousand comments and nearly 2 million occurrences, over 100 thousand different graphics and a significant number of hapaxes, taking account of neologisms, distorted expressions and nicknames. The corpus was divided and interpreted in accordance with the partition keys "politician page: Raggi or Giachetti"; "period of campaign: first two weeks or last two weeks", "number of 'likes' for each comment: none (61.6%), 1 (17.4%), 2-4 (10.7%), more than 5 (10.3%)".

Concerning the authors of the comments (around 60 thousand), a significant gap emerged between the set of occasional comments (more than half those who submitted comments did so only once during the entire period under consideration) and that of the regular users of the Facebook pages under study.

One interesting point is that the two contenders' virtual arena indiscriminately collects not only the supporters of the two political parties, but also a range of external commentators (non-Romans, non-supporters of either of the two political groups, etc.) who nevertheless want to have their say. This vast sea of words contains as much harsh invective, often sprinkled with foul language, as it does argumentation, analysis, and scholarly insight.

On balance, if we stop at the strictly quantitative analysis, the sub-corpora of comments to the posts of Raggi and Giachetti look remarkably alike. Some

differences can be appreciated through a consideration of details, from which, in Giachetti's case, the typical words that emerge include *hope, begin, PD, Marino, Verdini, Rutelli, Buzzi, Alemanno, Mafia Capital, Carminati, procurement, Casamonica* (for the Mafia Capital case), *stadium, subway, radical, Renzi, shame, buffoon, salary, resign, investigate, promise, ridiculous, bank, debt, villa, billion, ATAC* (the city transport service), *thief, convict, dance, democratic, forget, seat, liar*, for Raggi, *hope, begin, PD, woman, M5S, Raggi, best wishes, honesty, Italy, Roman, #coRAGGIO* (the main #hashtag of the M5S campaign), *congratulations, heart*.

In any case, the most representative element in the comments is gutter language, containing no shortage of catch phrases and epithets invented for the occasion.

The hard fighting and the stadium atmosphere (fanatical at best, and verbally abusive and threatening at its most negative), at times accompanied by invective and gratuitous insults (where the target, regardless of content, is an entire party, a leader, or an internet user with a different orientation) definitely come to the fore when issues in the text corpus are analyzed (the identikit of the candidates, the capital's most urgent problems, even in a national and international context, the expectations for change, the waste and thievery in public administration, the Olympics and large-scale public works, Mafia Capital, etc.).

On the other hand, the most striking fact – keeping in mind the posts of the candidates in the field – is that there is almost no correspondence between the topics of the comments and the arguments offered by the candidates. The emotional forms of support and the equally agitated forms of demolition often have no connection to the posts under which they appear: *"Listen dickhead, you're voting for that skank Raggi because retards like you understand each other"; "You saved the banks and fucked the poor. Shame! Just go home"; "The true left is Renzi"; "Romans we should all vote for the 5 Star Movement: it's an alternative for those who care about a better future for our children, grandchildren and for us Romans. Please don't do something stupid... and then complain about the result!!!"*.

We shall see in the following pages that without qualitative insights, the comments as a whole would tell us very little. Thanks to the mix of analytical tools selected and utilized, however, new research results emerge along with important confirmations at both the substantive and methodological level. The mantra of this and other authors' work on big text corpora downloaded from the internet is that moving back and forth in accordance with research requirements between quality and quantity, between big and small data, means that all elements are co-essential and integrated into a whole and no research choice is self-sufficient on its own.

III. THE CAMPAIGN CONVERSATIONS: LEADERSHIP AND IDENTITY

As we approach the heart of the qualitative analysis, the reader will note a number of issues that were “hidden” in the previous analysis.

Dealing with recursive patterns of dialogue, the issue of opinion leadership must be addressed. If it is true that a leader’s ability to exert influence depends on the same ability in that leader’s supporters’, then it is important to examine how Giachetti and Raggi’s own leadership was expressed through the actions of dozens of opinion leaders in micro-contexts (cf. Katz, Lazarsfeld, 1964; it. tr., 2000, pp. 713-64). For this purpose, Fb allows a reconstruction of some active lines of influence among citizens. If opinion leadership is attributable to “subjects in a position to function as amplifiers of the information to be conveyed and even to bring about changes in attitude” (Marchetti, 2014, p. 149), a distinction should be made between these two dimensions. On one hand, there are those who seem to be megaphones for a point of view without necessarily having an impact on the attitudes of others; on the other are those who effectively contribute to modifying the opinions of other individuals.

The reported conversations are articulated around a sort of hinge, represented by one or more users to whom all the others turn. In some cases the user in question seems to be regarded as a recognized representative of one of the candidates, either through a known link to an institution, a position of sympathy with a political group, or even only through political opinions expressed in comments on Fb.

The following is an excerpt conversation that may be taken as an example, in which users B and L seem to present themselves as being at the *center of the dialogue*. This means that the other users often address themselves to these two. The conversation is attributable to a post of Giachetti’s of 23 May that was then placed on Giachetti’s public page.

A: Fooling ignorant people is too easy Mr. Giachetti, the PD voters in Rome don’t know that the reason they’re paying a higher TARI [waste disposal tax] is because the juntas of both the LEFT and the RIGHT, including the one you were in with Rutelli, generated a Capitoline debt of over 16 billion. Why don’t you say this in your electoral campaign?

B: now tell me : what’s Giachetti got to do with this... I don’t get it.

A: B, if you can’t see it, I can’t explain it to you. If you make an effort, you might manage to grasp it on your own. Go on, think about it :-)

C: B, with all due respect, we can’t let the Roman PD get their hands on the city again after the mess

they made. Now they should even make Verdini’s people happy.

D: I think he’s a true and honest person, too bad about the party he belongs to.

E: We should choose the most honest people, never mind what flag they fly

F: Why, are the others any better?

G: I don’t like this wanting to tar everyone with the same brush!!! I vote PD and I consider myself an honest person and no one should presume to doubt it!!! It’s just the lowest demagoguery!!!

H: sorry, but how can you vote PD? (I’m not trying to provoke; I would just like to find someone to talk to about this without the insults)

G: And how can you not vote PD? Do you feel ok with this situation that’s been stagnant for at least 20 years? Don’t you think the time has come for a shakeup that will benefit everybody instead of just sitting there crying about it?

C: Excuse me G but in these last years when we’ve reached an unheard of level of chaos who is it that’s been in charge???

B: But do you vote for the man or the party...I don’t understand these people...what’s going on here...

I: G, your last comment defies definition, I can’t imagine that people exist who see things this way, Giachetti is a figurehead for organized crime with the PD label.

L: You can vote for Giachetti without voting PD. Split your votes. It’s what I’m going to do.

M: If you talk about waste, stopping the robbery, salary cuts, consulting, I’ll vote for you, otherwise forget it. Otherwise it’s just talk talk.

G: And I suppose “demonstrate demonstrate demonstrate...” is better? Anyway, jokes aside, he’s already talked about how to eliminate the waste and the robbery... it’s all there on Giachetti’s page...look it up. With respect.

M: G, the problem is I don’t buy it.

C: G, with all due respect, we can’t let the Roman PD get their hands on the city again after the mess they made. Now they should even make Verdini’s people happy.

M: I’m 55 and I’ve been voting for them for years, but that’s it, I’m done. That’s all there is to say; anyway they’ll win again for sure.

Two significant elements emerge in this conversational excerpt. The first is that apart from the comments of A and L, aggressively hostile to Giachetti, an articulate discussion seems to develop revealing positions that are distinct but nonetheless open to dialogue. The second is that some Fb users seem to take on a central/magnetic role that leads others to refer back to them, which to some extent allows them to guide the conversation.

In the following table (Tab. 1), we decided to define the political identities of the participants in the conversation not only through their declared political

affiliation, if any, but also by reference to Fb pages for which they specifically express an affinity.

Table 1: Political identity, level of education, level of attraction, topics addressed by Fb users (Conversation1)

	Political identity (Names of pages they like, groups they belong to)	Educational level	Level of attraction in the conversation (N. of comments/replies received)	Level of activity in the conversation (N. of comments submitted)	Topic addressed
A	-We don't like the M5S -Rosa D'Amato M5S spokesperson	BA degree (Agrarian Science)	1	2	Indefensibility of vote for Giachetti
B	-Roberto Speranza -Fabrizio Rondolino -Aurelio Mancuso	-	2	2	Defense of Giachetti's personal integrity
C	-All for the M5S -The 5 Star activist - Chiara Appendino - 5star news from Parliament - FilippoNogarin Mayor of Livorno	-	0	3	Necessity of not re-electing the PD in Rome
D	- 5star pride	High School diploma	0	1	Approval of Giachetti but not the PD
E	-A yes is enough -No Grillo -Just a yes to change Italy - We don't like the M5S	Middle School diploma	0	1	Need to value the person and not their political affiliation
F	-Reggio Emilia says yes -PD network -5stelle virus -Debora Serracchiani -Walter Veltroni -Dario France-schini	BA degree	0	1	Affirms that while the PD has its problems the alternative is no better
G	-A yes is enough -Supporters of Matteo Renzi -We are the PD	BA degree	5	3	Declaration of vote for PD and defense of Giachetti
H	-	-	0	1	Great difficulty in voting PD
I	-Salerno M5S	High School Diploma	0	1	Radical criticism of PD
L	-	BA degree (Statistics)	0	1	Option to split vote
M	-Lazio M5S -M5S Struggle and opposition -Isabella Adinolfi M5S candidate	High School Diploma	0	2	Distrust of Giachetti. Voted PD for years, now votes 5stelle

Concerning the relationship between political identity and opinion leadership, the voters who appear to side most with the party are the ones who get the most replies (G, in particular); the citizens who identify most clearly with the position of the PD militant seem to be those who actually receive more comments, mostly hostile. In this regard, the central position of G in the conversation seems to reside primarily in G's being identified as an advocate for the PD rather than in the

actual arguments proposed. This seems to uphold the principle that assuming a clear and highly recognizable position attracts the attention of others.

The Fb users, and especially a group of 5star supporters, seem interested in probing the strength of the arguments put forward, more actively exploring the limits of the positions taken. It appears, in other words, that PD militancy somehow gives rise to increased tension in the dialogue, which shows up in the

comments directed at the militant and is reflected both in their number and type. It is as if the Facebook page of the PD candidate were transformed into a sort of stage which affords visibility to the positions of the home team, and especially those of the two users most legitimately linked to the positions of the party.

Some participants in the conversation, either directly or less so, give advice about how to vote. Along with the two militants, B and G, who declare that they will vote PD, E and L also seem to lean toward voting for Giachetti. They base this preference, however, exclusively on the figure of the candidate, trying to separate him from his background. L in particular advises opting for a split vote that favors Giachetti without strengthening the PD. It should be pointed out that the information note on L's Fb page contains no identity reference to the PD, highlighting L's distance from the party and from any even minimally militant position.

The participants whose political identity is traceable to the M5S tend to reiterate that Rome must not be left in the hands of a group that colluded with people who contributed to the degradation of the city. Their comments take on the function of opposing anyone who tries to defend voting for Giachetti or the PD or both. The position of D, identifiable as a supporter of M5S, is that Giachetti may even be honest but that he cannot be voted for because of his party membership. This is the borderline position of a PD voter who has switched to M5S and who at the most might go so far as to sympathize with the PD candidate but will still deny him the vote.

The variability of political identities and strategies of argumentation can be summarized in the following table.

Table 2: Political identities and strategies of argumentation of Fb users (Conversation 1)

Political identity	Argumentative strategy	Fbuser
PD group		
Identity tied to specific politicians, mainly followers of Bersani	Removal of the candidate-party link	B
Identity tied to the Yes vote in the referendum for constitutional reform, a specific politician (Renzi) and to the PD as a party	Support for candidate and party	G
Identity tied to a specific politician and to the PD as a party	Negative portrayal of adversary (victory for opponent seen as extremely bad)	F
Identity tied to the Yes vote in the referendum for constitutional reform and opposition to Grillo	Removal of the candidate-party link	E
Neutral	Removal/termination of the candidate-party link	H - L
M5S group		
Identity tied to the Movement and to specific politicians	Negative portrayal of adversary (victory for opponent seen as extremely bad)	A - C - I
Identity tied to the Movement	Negative portrayal of adversary (victory for opponent seen as extremely bad)	D - I

It may be assumed that the push for change in the declarations of the two mayoral candidates' supporters may be due in the case of Giachetti to the personal trustworthiness of the candidate and to a more general momentum at the national level based on the referendum. Among Raggi's supporters, liberation takes the form of scrapping in its entirety the old ruling class that colluded in the Mafia Capital phenomenon.

IV. INTERACTIONS AND NARRATIVE MODELS COMPARED

If the PD supporters tend to highlight the reformist mission of their party in spite of the more or

less covertly recognized mistakes it made in Rome, the M5S narrative emphasizes the movement's anti-system vocation, as it did starting from the beginning of Virginia Raggi's campaign.

The following conversation helps clarify the 5star supporters intention to embark on a true process of liberation for the city of Rome. This is not a short-term battle culminating in an electoral victory, but a much farther-reaching undertaking, requiring a large-scale collective effort.

It is precisely this investment of energy and long-term support that is required, on one hand to weaken criminal powers and on the other to breathe life into a political system that will embody the ideal of the

Movement, which is to progress beyond representation to direct democracy in founding a truly self-governing community. The conversation that follows is taken from a post of Virginia Raggi's after the first round of voting, when she was sure of her position in the runoff against Giachetti.

A: I think Virginia will win and I really hope she does. But the problems will come later. They will try in every way possible to put a thousand spokes in her wheel so they can say 'See? The 5stars have failed, they can't govern, they're not capable. Come back and vote for us'. Making Virginia fail as mayor would pay the PD big dividends at the national level.

B: This is what we're all afraid of. Also because they have ALL, I mean, ALL the means – politics and the media – to do what you say.

C: This is why it's not enough to vote for her, we all, and I mean all have to work actively now and later...don't give up

D: Not so sure... I'm afraid that in the privacy of the voting booth there will be a lot of turncoats. The wavering on the Olympics and Metro C are not acceptable :(

E: Sorry to say I agree!!!! Too much urban decay!!!

F: The success of Virginia and all of the M5S depends on the responsibility and cooperation of us Romans.

G: don't be afraid of change

A: Of course not, naturally. But we need to be ready for what's coming. That's why we expect them to try everything to discredit us, like Quarto, aimed not so much at convinced Movement voters but more at those who are hesitant, uncertain, who maybe would vote with us but without understanding much about us. It's these people the pd is interested in, who don't even consider why they ought to support the 5 stars. If we're not ready we're in trouble.

H: You citizens will be the ones who help her, may the stars be with you...!

I: A, Raggi (if she's mayor) NEEDS THE SUPPORT OF ALL ROMANS every day, against the media and these asshole political types, turncoat administrators and even the newsagents!! Support for Raggi has to be unconditional and given every day even in the streets of Rome!

A: Very true. And with all our strength.

L: She's the only glimmer of light in the midst of all these pimps. If we want change now is the time and we have to keep believing in spite of everything. Go go Virginia

A: As I was saying, the pd supporters can do nothing but lie, spreading news that's inaccurate if not downright deceitful. This is the counterattack of those from 'the left'. I know what they say is not

true, but anyone who doesn't look into it or doesn't care will fall for it quite easily.

M: This is why if she is elected we have to help her, all us native and adopted Romans, to carry out the program! To see the stars once again

N: So here's X -- they change names but do the same ridiculous things: copying posts from other discussions and pasting them in to try and create disorder... RIDICULOUS BEYOND BELIEF!!!!!! You poor retards, everything posted is public, online and transparent. I'm waiting for you to put the same energy and effort into finding out who bankrolls the foundations that fund Renzi, the so-called Buffoon of the Arno, as well as SorBuzzi and SorCarminati, as I've had occasion to point out in the past. So long moron!!!!

B: X, I see you're shitting yourself, eh? Your freeloading time is about to run out, find yourself a REAL job!! What, you can't? Well, of course, with little Renzi the Hun around it's not so easy...

O: X I went and checked the site... now can you kindly tell me where to find the PD's 'expenses'?... thanks

P: Think about those in your party who in addition to taking bloated salaries steal as well and have reduced Italy and the Italians to sh*t.

Q: A... it's just what's happening in Livorno... I hope the people there reconfirm their trust in the Movement.

A: X These arguments of yours aren't the type that take in anyone who is even a little bit informed about things. These days you can easily find the proposed bill that was discussed and then voted down which was intended to exclude non-parties from the election and therefore from the possibility of being represented in parliament. If what you say were true, that is that the 5stars want to become a party, what better occasion than that? And instead they opposed it. So the facts are there to disprove this thesis.

I don't see how you can use the definition bovine movement for the common belief of many people who daily bear the weight of a political class that steals and is concerned only with its own interests, leaving the weight of its thievery to fall on the most vulnerable people.

R: so help her because the unemployed are trying to make ends meet? And then when you contribute if they don't give you anything back you can always go and steal wallets in the metro, seeing as how in the lockers of the gyms they already know you!

Unlike the conversations analyzed in the previous section, the narrative pattern that presents itself in this case shows no evidence of conflict, no attempt to promote some views over others.

Here the conversation tends rather to build up a narrative reinforcing a particular point of view asserting in short that even if Virginia Raggi were to win the election a dedicated show of unity and support would still be required of the citizenry. Powerful forces would continue to undermine her work even and especially after the election.

The the most magnetic user point of view (A) is augmented and strengthened through dialogue with other users, all unambiguously affiliated with M5S. The formulation of the narrative proceeds incrementally, growing and gaining strength at the same time (cf. Hedström, 2005; it. tr., 2006, p.111). In this process the roles of the leaders and the less magnetic users are both fundamental, the structure of the narrative proceeding with progressive comments from the leader in a game of incitement involving the enrichment of the original formulation.

Several observations may be made on the basis of the conversations analyzed. The first of these is that the most meaningful conversations do not seem to focus on any offline action/involvement, except of course for voting for one of the two candidates. The participation model that emerges from the conversations seems to fit with a type of online participation that has been defined as 'couch activism' (cf. Di Giammaria, Gennaro, 2013), basically online chatting among citizens. In other words, the conversations show no significant presence of decision-making concerning offline actions other than mere voting behavior. Thus they do not seem to have any direct impact on participatory activity external to the network.

Among the PD supporters the difference in level of attraction between those who identify with the party and those who express a political identity linked exclusively to a specific personality, most notably Giachetti, emerges quite clearly. In contrast, supporters of the M5S seem uniformly focused on emphasizing the value of both individual personalities (Raggi and many other leaders of local and national importance) and the Movement in its own right. Disappointed leftists and supporters of the Social Right are both recognizable among them.

Giachetti's supporters seem to represent a vision whose approach is reformist and a liberal conception of democracy based on a separation of powers and the principle of representation. Raggi's supporters seem instead to embrace a vision oriented toward moving beyond the *status quo*, which on one hand channels its aggressiveness into anti-system criticism, and on the other presents itself as a project of wide scope whose slogans invoke the formation of cohesive and self-governing communities.

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Logistics Controlling: The Driver of Advanced Logistics Efficiency

By Méhesné Dr. Berek Szilvia

Pallasz Athéné University Szolnok

Abstract- Logistics controlling is an indispensable element of success for companies in advanced economies. The complex nature of the economic and logistic processes requires that they are being monitored and kept under control so they are properly coordinated, modified and adjusted when needed. Logistics controlling is a technology that is designed to satisfy these requirements. Success and efficiency in business largely depends on how accurately the companies are able to delineate their own profiles and environments, and how flexible they are in adjusting themselves to the changes going on in their environment. In my research I aspire to prove that logistics controlling is a potent tool for companies desiring to be more successful in business by improving their productivity.

Keywords: logistics, information, readiness, management, control.

GJMBR-G Classification: JEL Code: B49



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I. INTRODUCTION

Current challenges of the economic environment are making a pressure on the companies to be thorough and rigorous in preparing their decisions so they hold themselves ready to bring proper and timely decisions in the changing **global** market environment of our day. The dynamic markets spur on the companies to be fast and flexible in **adjusting** themselves to the changes. They are challenged, among others, to reduce their expenses to the **minimum**, and to increase their incomes, quality standards and reliability to the **maximum**. None the less, the companies have to comply with the requirements of the economic transparency, efficiency and optimal operation, continuous supply of information, timeliness, adaptability and flexibility.

In order to be profitable in a sensitive market, the companies have to acquire such integrated information systems that are suited to retrieve relevant live information and data of high reliability and applicability which can be then used in support of well grounded and sophisticated decision making processes. In addition, such information systems must ensure that the economic procedures of the enterprises can readily be modified or corrected whenever needed. The logistics controlling system discussed herein is perfectly suited to meet these requirements.

The importance of this logistics system lies in its comprehensible approach to the company processes, to the specificities of their activities and management.

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Given that the details of a business are interconnected with each other, an effective information system has to be capable of handling and managing such type of complexity. It follows from the comprehensive, whole-company nature of the collected information that every single correction made within the system will have an overall effect on the rest of the company, which, in turn though, may save considerable amounts of money and time. The proper application of the system, naturally, requires competent users as it is men and not computer programs that will take the responsibility for the decisions made.

My PhD research endeavors to prove that the logistics controlling system discussed herein is capable of giving the enterprises the best tool to respond to the ever growing requirements of the rapidly changing global market situations. At the same time, the controlling system will further the companies in maximizing their profits and minimizing their expenses.

Of the hypotheses formulated in my doctoral paper, here I will discuss two:

- Logistics controlling enhances the efficiency of the logistics processes (procurement, forwarding, storage and sales).
- Logistics controlling makes the company logistics more effective.

II. MATERIALS AND METHOD

Samples were taken from a population of enterprises engaging in activities closely related to logistics; the enterprises have it in common that they lay a strong emphasis on controlling, especially on logistics controlling. Proportionate to the national distribution ratio, the reference sample comprises enterprises with agricultural, industrial and service profiles. Due to its diverse nature, logistics is found in each of the branches of the national economy. Being aware of this, I sent out the questioners to 1500 enterprises.

It was one of my research priorities that the enterprises of the sample population are selected according to and structured by their logistics profiles, irrespective of their sizes.

I had 198 valid responses sent back to me. Because of their low number, the companies with agricultural profiles have not been included in the sample.

In my research I applied the following research methods:

- Questioner survey
- Evaluation of the survey data:
 - Quantitative analysis
 - Qualitative analysis
- On-line data collection
- Off-line face-to-face data collection
- Case study
- Interviews

III. RESEARCH RESULTS

The logistics controlling method is designed to coordinate and analyse the tasks of logistics, which in final issue means linking logistics and controlling together. "Logistics operations can only be successful if the subtasks of the sequence are professionally and accurately coordinated and there is no room left for collisions between them. (...) An indispensable requirement of the holistic systems approach is the inclusion of control and feedback processes. The lack of

control may cause the operation of the organization to break up and, in final issue, to become inoperative. Market pressure, on the other hand, is making adaptation, readjustment, and reorganization of the enterprises and their operations inevitable." (MÉHESNÉ, 2011).

In **Hypothesis 1** I presume that "Logistics controlling enhances the efficiency of the logistics processes (procurement, forwarding, storage and sales)." The assumption is based on the systems approach principle which says that the operations of a company are to be tackled and managed in a holistic, comprehensive fashion. Compound processes by nature have to be regularly revised so they can operate reliably and properly. The question to be answered here is whether the regular feedback and control activities will actually make the operational processes more efficient.

To answer this question I analysed the use and impact of the controlling systems with the companies included in the survey. The results are shown in Table 1 below:

Table 1: The impact of logistics controlling on the organizations

144 companies applying logistics controlling systems			
Industry		Services	
58,6%		41,4%	
Improvement recorded	No improvement recorded	Improvement recorded	No improvement recorded
36,8%	21,8%	12,6%	28,7%
Reduction of logistics costs recorded			
27,6%		4,6%	
Reduction of logistics costs per unit			
15%-25%		10%-15%	

Source: Own research and development

There are 144 companies applying logistics controlling techniques; 58.6% of the companies have industrial and 41.4% have service profiles. It has been found that 36.8% of the companies in the industry and 12.6% in the services sector realized improvement thanks to the application of the technique; they recorded 27.6% and 4.6% reduction of their logistics costs, and 15-25% and 10-15% of reduction of their logistics costs per unit, respectively. The positive impact of the logistics controlling application is different between the two sectors. There is a higher proportion of companies with industrial profiles satisfied with the application of the system, while those in the services sector do not seem to have experienced significant improvement. The cause, probably, is that in contrast to those in the services sector, for companies dealing with materials in physical terms logistics is of higher importance. Consequently, the improvement achieved due to the application of the logistics controlling system has a

more significant positive impact on their operation too. Nevertheless, the overall positive impact of the logistics controlling technique is obvious in the services sector just as well.

For a more precise analysis of the impact of the system, I hold it important to investigate the logistics costs per unit data in further detail (Table 2).

Table 2: Logistics costs per unit in companies applying the logistics controlling system

144 companies applying logistics controlling systems	
Improvement recorded	No improvement recorded
49,31%	50,69%
Logistics costs per unit	
Reduction	Stagnation
23,61%	50,69%
Industry	Volume
20,14%	15%-25%
Services	Volume
3,47%	10%-15%

Source: Own research and development

Data in Table 2 show very close measures of companies experiencing improvement in their logistics costs per unit and of those experiencing no such improvement (49.31% and 50.69%, respectively). Those realizing positive impacts reported the reduction of their logistics costs. The reduction is measured 15-25% with the industrial companies, and 10-15% with the services.

It is important to note, though, that there is only stagnation and no increase of costs found even with companies that do not report any improvement.

In order to see the difference between the application and non-application of the logistics controlling system, I drew up a table with respective data on companies not using the system (Table 3).

Table 3: Logistics costs per unit in companies not applying the logistics controlling system

54 companies not applying logistics controlling systems			
Logistics costs per unit	Increase	Stagnation	Reduction
Industry	22,22%	22,22%	5,56%
Services	5,56%	29,63%	14,81%
Total	27,78%	51,85%	20,37%
Change %			
Industry	0-15%	-	5-8%
Services	0-12%	-	3-5%

Source: Own research and development

The basic difference between Table 2 and Table 3 is the data shown in column "Increase" referring to the increase of the logistics costs. Whilst there are some companies that can succeed in reducing their logistics cost per unit without using the logistics controlling system, their number (20.37%) and the volume of the cost reduction achieved (3-8%) are very low, much lower than the respective figures of stagnation and increase.

In sum, data of Tables 1, 2 and 3 lead us to the conclusion that the application of the logistics controlling system facilitates the reduction of per unit logistics costs in general, and the occurrence of the cost reduction is much more typical and of higher volume for companies using it.

Thus, my **Hypothesis 1** presuming that "Logistics controlling enhances the efficiency of the logistics processes (procurement, forwarding, storage and sales)" **has been justified**.

My full length PhD paper is discussing several other examples of the positive impacts of the logistics controlling system. It has been found in conclusion that thanks to its flexibility the system is highly adaptable for use in a variety of company profiles. In order to verify this assumption I completed my research by conducting face-to-face questioner interviews with 10 companies.

Efficiency is a relative concept, there is no single formula known to measure it in exact terms (SZÜCS and FARKASNÉ FEKETE, 2008). The general definition, however, is the following:

- Efficiency = Return/Expenditure
- Efficiency = Expenditure/Return
- Efficiency = Return/Return
- Efficiency = Expenditure/Expenditure

Relying on these definitions, the concept of efficiency, the ratios of the different combinations of returns and expenditures (outputs and inputs) can be determined.

The survey interviews were made with persons in senior positions capable of influencing the management of the company (logistics) processes and having sound competences in the application of the logistics controlling system.

The companies interviewed have the following principle activities:

Table 4: Principle activities of the companies

Principle activity	(%)
Food industry	20
Electronics	40
Trade and commerce	20
Special machine manufacturing	20

Source: Own research and development

The companies have a wide variety of profiles, but they have it in common that they have been successful in improving their productivity by the application of the logistics controlling system.

The research results showing the positive impact of the logistics controlling system on the productivity are summarized in Table 5 below.

Table 5: Practical pay-offs of logistics controlling application with 10 enterprises

Achievement	Rate of realization (%)	Range (%)
Improved income	30	10-15
Reduced inventory	60	5-15
Reduced logistics costs per unit output	50	5-10
Improved efficiency	30	-
Contractor selection by efficiency indicators	40	-
Improved control of contractors	50	-
Updated production, sales and planning	10	-

Source: Own research and development

The data show that each of the enterprises has achieved improvement by the application of the logistics controlling system. The number of those realizing pay-offs and the range of the pay-offs, however, differ according to the type of their principle activities.

The highest is the proportion of those being successful in reducing their inventory (60%). Somewhat lower but still high (50%) is the proportion of enterprises succeeding in reducing their logistics costs per unit output, and improving the control and follow-up processes of their contractors. 30% of the respondents can see the growth of their incomes.

The positive impact of the logistics controlling mechanism is not something that is always seen promptly in the costs and incomes lines; the method will first "put the operation in order", which will in due turn generate reduced expenses and improved incomes for the company budget.

Taken it in general, improvement in productivity is achieved usually when the outputs are growing and the inputs are reducing, or these two are taking place simultaneously. In our case, all the three of the alternatives of achievement are seen: improved

incomes, reduced logistics costs per unit output, and the volume of the inventory that also is contributing to the growth or reduction of the expenses.

It must also be noted, however, that actual improvement of efficiency has been recorded with 30% of the respondents only. The reason for this lies in the very concept of efficiency. Given that it is a complex concept, it is impossible to use a single formula to express it. This means that, within certain limitations, there is always room for subjective interpretation left.

In sum, we can say that logistics controlling does function as a tool of efficiency improvement for the enterprises, which is a proof of my **Hypothesis 2**.

IV. CONCLUSION

An important expectation of the modern enterprises challenged by and aiming to preserve their positions in the rapidly growing and ever competing (global) markets is that they ensure a maximum level of productivity, a minimum but still competitive level of expenses, prompt adaptability to the market environment, and transparency, reliability, timeliness and flexibility.

The integrated company management systems and controlling systems can offer feasible techniques for the enterprises so they are able to respond to the challenges of the markets. An important advantage of these systems is that they are not “static”, instead, they are flexible and readily adaptable to any given organization profile, and also, they are capable of ensuring improved profitability by minimizing costs and maximizing incomes.

The final outcome of the research justifies the practical feasibility of the logistics controlling system for organizations striving to improve and maintain a high level of productivity for the long run.

Literature:





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Identification of the Barriers in Implementation of Lean Principles in Iranian SMEs: Case Study Approach

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Abstract- The manufacturing sector is considered to be a cornerstone in the global economy through its influence on areas such as mining and construction in upstream and warehousing and transportation in downstream. Despite having a rich literature concerning the application of lean principles in the large companies, the number of studies related to SMEs is relatively limited and a lot of essential problems and areas are largely untouched in academic research. This paper aims to identify the main barriers in implementation of lean manufacturing principles in Iranian SMEs. In order to do so, case study approach was selected and 9 in-depth interviews were conducted in various industrial sectors such as electrical equipment, industrial machinery and automotive part supplier. As a result the main barriers were classified into four categories namely, lack of top management support, financial capability, lack of employee's skill and expertise and organizational culture. Accordingly a guideline was developed that can be adopted to address the aforementioned barriers and reduce their costs by adopting the lean principles.

Keywords: *Lean manufacturing, lean thinking, Iranian SMEs.*

GJMBR-G Classification: *JEL Code: L39*



IDENTIFICATION OF THE BARRIERS IN IMPLEMENTATION OF LEAN PRINCIPLES IN IRANIAN SME CASE STUDY APPROACH

Strictly as per the compliance and regulations of:



Identification of the Barriers in Implementation of Lean Principles in Iranian SMEs: Case Study Approach

Hamid Moradlou ^α & Terrence Perera ^σ

Abstract- The manufacturing sector is considered to be a cornerstone in the global economy through its influence on areas such as mining and construction in upstream and warehousing and transportation in downstream. Despite having a rich literature concerning the application of lean principles in the large companies, the number of studies related to SMEs is relatively limited and a lot of essential problems and areas are largely untouched in academic research. This paper aims to identify the main barriers in implementation of lean manufacturing principles in Iranian SMEs. In order to do so, case study approach was selected and 9 in-depth interviews were conducted in various industrial sectors such as electrical equipment, industrial machinery and automotive part supplier. As a result the main barriers were classified into four categories namely, lack of top management support, financial capability, lack of employee's skill and expertise and organizational culture. Accordingly a guideline was developed that can be adopted to address the aforementioned barriers and reduce their costs by adopting the lean principles.

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I. INTRODUCTION

The manufacturing sector has been playing a critical role in developing and advancing the world. This is evident as the developed countries such as USA, Germany and the UK, are planning to win back their manufacturing sectors from low cost countries (Moradlou and Backhouse 2016a; Moradlou et al. 2017). It is considered to be a cornerstone in the global economy through its influence on areas such as mining and construction in upstream and warehousing and transportation in downstream. This has resulted in various challenges to develop new approaches to maximize the production efficiency in terms of cost, quality of the products, required resources, environmental impacts and many others described by Liker (2004). The emphasis for perfection in manufacturing operations has been evolving throughout history. As the time passes, with the aid of advanced technologies, the lean manufacturing techniques have gained considerable popularity among the Iranian industries to boost productivity, effectiveness,

responsiveness and the quality of the product. This is further emphasized as the Iranian industries are trying to attract foreign investment in manufacturing sector after the economic sanctions being removed in 2015 (Dyer and Bozorgmehr 2016).

It is concluded from the available literature that the lean and techniques are theoretically applicable in all industries and has proven their success in practice specifically in large organizations (Rose et al., 2011). Despite having a rich literature about the applicability of the lean tools in large companies and the importance of these production philosophies in SMEs, it is evident that there is still a gap existing in the current knowledge to provide a classification of tools that enables the SMEs to adopt these two approaches. Due to the dearth in the available literature and the lack of emphasis within the industries, lean manufacturing concepts have not been widely introduced to the Iranian SMEs, hence the advantages of such production philosophies are not fully appreciated within the Iran's business environment. Consequently it can be seen that the number of manufacturing SMEs are gradually decreasing in the Iran's manufacturing sector regardless of their substantial influence in the overall economy of the country and being shifted to the countries that offer lower production costs similar to the off shoring trend in developed countries (Moradlou and Backhouse 2014; Moradlou and Backhouse 2016b).

One of the reasons behind this is that the SMEs are considered to be relatively vulnerable to the new entrants in the market therefore their market share can be easily replaced by other competitors. In addition the lean manufacturers at the head of supply chain tend to start the business with the suppliers who are capable of aligning their processes to comply with lean manufacturing. This is due to the lack of production strategies such as lean systems in the case of facing a turbulent business environment and inadequate knowledge about the lean principles for the cost reduction and effective production (Achanga et al., 2006).

II. LITERATURE REVIEW

The challenge for cost reduction in manufacturing sectors have prompted the majority of

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the companies regardless of the business size, to adopt the lean manufacturing system to boost their competitiveness in the intensified global market. According to Hogg (2008), lean is “a mindset, or way of thinking, with a commitment to achieve a totally waste-free operation that’s focused on your customer’s success. It is achieved by simplifying and continuously improving all processes and relationships in an environment of trust, respect and full employee involvement. It is about people, simplicity, flow, visibility, partnerships and true value as perceived by the customer”. A comprehensive definition for the non-value added processes “wastes” was given by Russell & Taylor (1999) as follow: “anything other than the minimum amount of equipment materials, parts, space, and time that are essential to add value to the product”.

According to Womack et al., (1990), the main objective in the implementation of lean techniques is to design a system with a smooth process, which enables the companies to manufacture world-class quality products and services to satisfy the customer demand while eliminating wastes. In order to achieve that, it is important for the companies to recognize the wastes associated with their manufacturing systems. To simplify this task, Shingo (1992) established the concept of seven deadly wastes. This identifies seven different categories of manufacturing wastes as follow: overproduction, over-processing, transportation, inventory, motion, defects and waiting time. Further indication was given by Ohno about the overproduction to be the most important waste among the other non-value added activities since it ultimately leads to excessive inventory in the operations downstream (Liker, 2004).

Womack et al., (1990) claimed that it is the employees that determine the level of leanness within the companies and they can be considered to be the heart of the lean organization. This emphasizes the importance of sharing the lean knowledge among the employees of all levels which results in their participation and contribution. This can ultimately result in lean culture within the organization, which is considered to be a crucial challenge for management (Worley & Doolen, 2006).

Despite having a rich literature concerning the application of lean principles in the large companies, the number of studies related to Iranian SMEs is relatively limited and a lot of essential problems and areas are largely untouched in academic research. Zhou (2012) has stated that the failure in implementation of the lean programs are due to the style of the management or people related factors as well as the key knowledge and know-how. Correspondingly Achanga et al., (2006) believes that there is a connection between management styles and the company outputs such as the lead-time, number of employees and the return on investments (ROIs). He argued that the main lean

barriers are not tools and technologies, but the lack of appreciation and provisions from middle and senior management. This can be also found in the study done by Moradlou and Asadi (2015) where top management is one of the key reasons behind the management of SMEs in a fluctuating environment. This is while Salaheldin (2005) claims that the lack of skilled resources for implementing the lean practices is the main obstacle for SMEs to be lean. However Shah and Ward (2003) believe that the main obstacle in implementation of lean tools, is considered to be the size of the organization. This was further emphasized through particular suggestion that not all Just In Time (JIT) practices can be a suitable solution to be applied in SMEs (Shah & Ward, 2003). Cusumano (1994) also studied the feasibility of the lean implementation in SMEs but in his studies, he concluded that the product variety could be the major consideration that leads to an unsuccessful lean implementation for any company (Cusumano, 1994)

III. METHODOLOGY

For the purpose of this investigation, qualitative data collection method was nominated since this technique offers a range of benefits in this instance (Klein & Myers, 1999). These types of research enable to gather in depth information about the human behavior and their justifications. It also determines the reason behind any decision-making (why and how) as well as the time and location of each decision. Therefore one of the advantages of qualitative research is that it allows discovering the reason for any failure or success in implementation of lean programs. Another advantage of this technique is its flexibility according to the types of the industries being studied (Patton, 1990). It should be noted that according to Akhoondi & Morshedi (2012) the companies having less than 100 employees fall into the SME category in Iran whereas this number is different in other countries.

In order to undertake the interviews, an open-ended questionnaire was used in 9 different companies in Iran. Table 1 provides the demographic information of the companies that were visited and interviewed. This approach has been recommended by various authors such as Ribeiro & Fernandes (2009) and Powella et al., (2013) who have carried out similar studies to this investigation. Planning an exploratory interview questions can only be achieved after obtaining a good understanding of the recent literature about the lean techniques and the relevant tools that supports their objectives. It is also essential to discover their functionalities within different industries (electronic, food, etc.), meanwhile to gather adequate knowledge about the Small and Medium Enterprises in Iran. For the purpose of this investigation the interview questions contains only basic terms. It was found that the SMEs

tend to have limited knowledge about the technical terms used in the lean manufacturing principles. Therefore to minimize the misinterpretations the generalized questions were asked to cover wider areas and the results were then extracted from the recorded or written documents during the interviews. The data

gathering addresses the questions about the lean techniques and how the companies approach the design changes and respond to the demand fluctuation. It also questions to what extent the companies manufacture customized product and the possible barriers in implementation of lean manufacturing.

Table 1: Company Demographics

Sector	Firm	Number of employees	Informant position
Electrical Equipment	Manufacturer 1	105	Supply Chain Manager
	Manufacturer 2	90	Supply Chain Manager
	Manufacturer 3	56	Managing Director
Industrial Machinery	Manufacturer 4	80	Supply Chain Manager
	Manufacturer 5	50	Managing Director
	Manufacturer 6	35	Managing Director
	Manufacturer 7	42	Managing Director
Automotive Part Supplier	Manufacturer 8	70	Sales and Marketing Manager
	Manufacturer 9	25	Managing Director

IV. FINDINGS

After performing a qualitative data analysis based on interviews and visiting 9 different organizations in Iran, the following observations were drawn to provide an in-depth understanding of the barriers in implementation of lean programs in Iranian SMEs and to facilitate the identification of a general solution for companies to adopt lean principles. Hence, in order to analyze the interviews it is essential to assess the company's level of understanding about the lean principles. One way to do this is to question the number of years that these companies have employed lean practices within their systems. As a result, the targeted companies were divided into two categories. The first category was the companies that had no previous knowledge about the lean techniques therefore did not have any desire on implementation of lean programs. These companies appeared to have a limited understanding of any tangible and intangible advantages gained by lean production. The results show that only four companies out of the nine companies could be allocated in this category. The second category was the organizations that have established a clear understanding of the lean concept or have already attempted on adopting the principles to reduce their production cost and improve their line efficiency. This category consists of mainly the medium sized enterprises due to the size of the organization and the importance of maintaining a low cost production. Consequently the remaining five companies were included in the second classification, which represent the majority of the companies selected for the purpose of this investigation. The result shows that the medium size companies visited, have all taken the first steps towards development of leanness however they have experienced a range of barriers in different aspects.

According to the results obtained, the second categories of companies described above, adopt lean principles due to variety of reasons. The most important factor, which was shared by almost all of the companies, was the reduction in cost to improve the profit margin. Other factors such as improvement in space utilization in the factory, improvement in the product quality, reduction in lead-time, reduction in the manpower required, improvement in the competitive position within the market, reduction in the inventory and improvement of the collaboration with their suppliers were also taken into account.

After accomplishing nine interviews from different industries, the reasons for the failure in implementation of the lean practices in Iran were classified into four fundamental categories which appear to be consistent with the research available in the literature suggested by the researchers such as Achanga et. al., (2006) and Zhou (2012). Figure 1 highlights these four reasons which are the lack of top management support for implementing lean programs, financial capabilities of the organisation, skills and expertise of the employees and finally the culture of the organisations that plan to implement the lean practice.

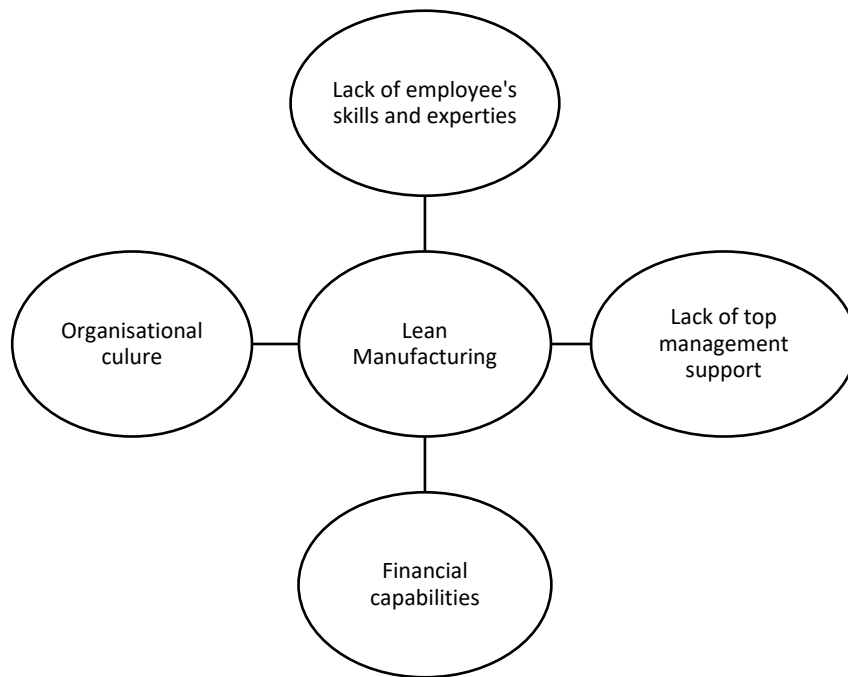


Figure 1: Main barriers in implementation of lean manufacturing in Iranian SMEs

a) *Lack of top management support*

Management contribution and provision is considered to be one of the biggest challenges in successful implementation of lean practises. A large number of SMEs fail to achieve lean objectives due to the lack of providing appropriate support and foundation for lean programs. One of the major tasks that the managers do not perceive as one of their core responsibilities, is the encouragement for employee participation. In other words, members of the organisation were not involved in the improvement of the processes. This was observed as one of the managers stated:

"In our company the decision making processes are carried out among the top managers and then are introduced to the line personnel" (Manufacturer 3)

According to the interviews, seven companies experienced the fact that their production managers did not establish a clear communication with the employees to introduce the vision and the strategy of their production. Therefore there was a lack of commitment on training other members of the organisation to enhance the skills and experties among the workforce. Due to the nature of lean principles, continues improvement in production processes is required to be achieved by the managers in order to prevent backsliding to the old ways of operation.

b) *Financial capabilities*

Another critical obstacle in the implementation of lean principles is found to be the financial and resource constraints that SMEs face when investing in lean programs. This ultimately prohibits the companies to hire their ideal management team and consultant for

the training required for lean practices and leads to a poor system implementation. This is due to the nature of the small and medium size companies (number of employees and annual turnover). It should be noted that the lean manufacturing tools require company's financial capabilities. In order to support the system and its activities, every company is required to dedicate the implementation cost. Moreover there is a substantial variation in capital required according to the purpose of each tool. In addition to the capital required for each tool, there is a cost for the consultancy and training. The reason behind this is that the majority of small companies are incapable of transforming their organization towards leanness and require external consultants who can provide the necessary knowledge about different techniques and educate their employees.

Another factor related to the finance was discovered to be the resistance of the companies towards dedicating extra capital on process improvement. This was observed when six interviewees stated that they could not afford the cost of implementing lean tools in specific occasions such as long-term strategies and they would prefer to focus on cost saving activities rather than any other additional costs on processes. In addition to this, three companies believed that any cost dedicated to training and consultancy is considered to be loss of resources and can be used for alternative purposes such as purchase of raw material. The following quotation is from a managing director:

"We already have high demand for our products and we don't see the necessity for further training, so any extra capital we get are spent on buying the material required for our production" (Manufacturer 7)

c) *Employee's skills and expertise*

Due to the financial incapability, it was found that all the targeted companies in this investigation have a tendency to employ highly skilled yet cost efficient personnel. Consequently these employees do not have sufficient background about lean principles. Therefore this is considered to be a hindrance to the implementation of competitive technologies for improving productivity and flexibility. This appeared as the small companies intend to carry on with the traditional production method as long as they can sustain their businesses.

It was also observed that one of the most critical triggers in unsuccessful lean programs is the lack of training, education and technical knowledge. In other words being unable to provide the appropriate form of training for each and every one in order for them to be able to do their job properly (Shibani et al., 2012). This fact would create obstacles, which prevents the development of lean programs. It was found that these barriers emerge in different formats. The first problem can appear in terms of inadequate knowledge about the lean in employees resulting in confusion on the program and not fully acknowledging the benefits. This ultimately contributes to the employee resistance since they are not directly involved in the planning and implementation phases of leanness (Haupt & Whiteman, 2004). Therefore lack of training has a substantial influence on the participation of the employees in decision-making.

"According to my experience as a line manager in this company, the new employees come with limited background about lean tools therefore it requires a substantial effort to teach them what lean actually means and what its benefits are" (Manufacturer 1)

Another issue caused by inadequate training was observed in terms of absence of work discipline. This is due to the inappropriate division of the tasks in the organization, which determines the contribution of the employees to the lean program. Since the implementation of the lean principles should be carried out in a team, it is important to keep the team members motivated by introducing the benefits of the program and clearly defining the aims and objectives of the lean methodology. So the employees are familiarized with the lean concept, which leads to further collaboration of team members.

d) *Organisation culture*

The establishment of an appropriate organizational culture is another crucial element in lean implementation. This provides a suitable platform for a better collaboration in a diverse environment. This enhances the importance of the management roles in overcoming the conflicts in organizations. The responses from the interviews emphasize that it is important to understand people growing up in different environment and background would ultimately have

different cultures. This is also considered to be another potential factor caused by insufficient training, which leads to the failure in lean implementation since it determines the way people deal with the conflicts. The resistance to changes would be substantial if there is particularly deep-seated culture (Ngowi, 2000). The provision of insufficient training and uncertainty about the lean benefits can have a demotivating outcome on the members of the organizations. This is also supported by other researchers such as Achanga et al., (2006) who have also suggested that the absence of an appropriate organizational culture have negative effects such as employee resistance to changes and lack of focus on their long-term roles.

e) *Guideline for implementing lean principles*

In order to promote the lean thinking within an organization and fully employ the lean techniques, companies are required to undergo significant cultural transformation which can be achieved over the years. But there are number of critical success factors that should be adopted to facilitate the lean implementations in short term. This study attempts to address the main reasons that the SMEs in Iran fail to adopt lean manufacturing techniques and emphasizes on the key criteria to establish a suitable platform for leanness. In this section of the paper, a series of recommendations are included as a guideline for the industries to remain competitive and healthy in the business by applying lean tools. According to the literature, the SMEs are incapable of applying all the techniques at the same time therefore they are recommended to approach sequentially in order to avoid any difficulties in terms of finance and employee's commitments (Rose et al., 2011). As a result of this investigation, the outcome can be classified into two categories. The first category emphasizes on providing a suitable environment to accelerate the productivity, efficiency and the quality improvement in products and services while the second category includes a set of tools that are the most feasible to be applied in SMEs.

f) *Creating a lean environment*

As it was mentioned before, despite the fact that the top management plays an important role in implementation of the lean principles, the entire population of the organization should undertake the responsibility of participation and commitment to their tasks. These responsibilities are for all the members of the organization from the line personnel such as the technicians, operators and shop floor workers to the vice presidents and senior manager. Hence the lean culture is a vital element of leanness and is considered to be the most challenging task in initial phases of lean implementation (Zhou, 2012).

Cultural changes take time; it cannot be accomplished overnight or in a few weeks. In order to prevent the risk of the failures in the lean

implementation, two approaches are suggested to provide the essential background about the program and its applications in the organization and train the team for the continuous improvement. The first method is the formal training. This can be achieved by commissioning a leading consulting group that can educate the managing directors and teach them the key elements in execution of the lean programs. Their knowledge can ultimately be used to provide the sufficient technical material for the rest of the organization. This method tends to be an easy solution in the small organizations since it has fewer layers of management and staff (Ghobadian & Gallea 2001). However this can be a great disadvantage for the small companies in terms of the significant requirement for financial support. An alternative approach for training is the informal guidance. One way to achieve this is to display information about lean tools on the company's bulletin board. This information can be gradually observed by the members of organizations since it is always available and can be easily updated every month. The training provided by the organizations can take two forms. In the first method the principle of the lean manufacturing and training are delivered. This can familiarise the team members with the concept of leanness. Then further training can be subjected in terms of preparation exercise for the members to face and address the problems by adopting lean tools and techniques. To do so, examples from real life problems can be introduced (Kassiech & Yourstone, 1998; Amar & Zain, 2002).

As a result of the training methodologies mentioned above, the organization members would be encouraged to undertake more responsibilities, develop their creativity skills, be innovative, improve their communication skills and work effectively. According to Tenner and DeToro (1992) "Education and training provides the knowledge needed on the mission, vision, direction, and strategy of the organization as well as the skill need to secure quality improvement and resolve problems".

As part of the management responsibilities and cultural platform, it is important to ensure a no-blame environment within the company. In such an environment the mistakes are approached as an opportunity to learn more about the elimination of the potential causes. This is achieved by establishing a close relationship between the managers and the workers. It is important to have in mind that the mistake can frequently occur and are part of the facts in all employees work life. Hence in the case of any failure in the processes, pointing at people should be avoided. Managers should also ensure a regular conversation with the employees involving questioning, listening, observing and judging, to boost their self-esteem. This is done by arranging regular meetings to allow people to share their assignments and achievements. In order to

ensure an effective participation in every meeting, firstly the aims and objectives of that meeting should be clearly communicated and then the time frame and agenda should be mutually agreed with other members of the organization. Moreover after every meeting a summary of activities that are required to be carried out until the next meeting can be obtained highlighting critical tasks.

Another key element that needs to be considered is to provide a clear vision when starting any process improvement program. According to Covey (1989), to establish an understandable vision, the following characteristics should be taken into account. It should

- Be instigated by the managers
- Be inspiring and positive to motivate the team members
- Include adequate level of details and be easy to understand
- Be shared among the group members
- Be concise and easy to remember

After adopting a suitable management style and organizational culture, the next task is to select the feasible tools and techniques that can be applied in SMEs regardless of their size and financial capabilities, which is included in the following section.

g) Applicable lean tools in SMEs

Due to the limited budget available within SMEs, these companies are cautious in the investments regarding the productivity, efficacy and quality improvement programs. This has reduced the range of tools available for the SMEs. In this section of the paper some tools are recommended as feasible examples to be applied in Iranian SMEs that are already in operation. This can encompass the factory layout design process. Layout design process for a production line involves determination of the physical relationship between workstations or equipment and identification of the tasks, which need to be allocated in each of them (Arostegui et al., 2006). Thus it is an essential task to define a close relationship between product design, process design, schedule design and layout design while designing a factory plant. Therefore this allows obtaining the optimum design, which would minimize the material handling cost and time. At present different types of layout designs can be adopted in production lines according to nature of the production. In other words these layouts are selected or combined as a hybrid layouts based on system characteristics such as production volume and product mix. These layouts are fixed position layout, functional layout (job shop and process layout), cell layout (group technology) and product layout, which is also called flow shop layout (Askin & Standridge, 1993). Note that by this stage, some of the most essential lean tools should be applied

as part of factory layout design. For instance, tools such as cell layout pull system, Kanban systems, one-piece flow and poka-yoke can be taken into account from the early stages of designs. Once the mentioned considerations are taken into account the following recommendations can be applied in an already operating organization to increase the production efficiencies, productivity and quality.

As a suggestion for initial step towards leanness, one would recommend the lean consideration during the product design stage. According to the National Research Council Canada (2004), the consideration of lean principles at product design stage can reduce the problems caused during the production up to 92%. In order to do so, firstly the designers should attempt to minimize the complexity of the product in order to reduce the waste created in manufacturing stage. Another important step towards leanness is to standardize the components used in the products to ensure the reusability of the parts in different products. This strategy can be also employed in system architecture and factory layout design to allow mass customization downstream of the production. It is also important to build the quality in products during the design phase. One method used for this is six-sigma methodology.

After applying the lean principles in the design phase, various lean tools can be recommended according to their purpose. Note that these recommendations are based on the existing literature and data collected during the interviews. It appears that some of these tools have already been applied within the case studies selected in this investigation (medium size companies) and have proven to be successful such as work place organization 5S systems and process mapping. It was found that the 5S system is the most suitable tool to be applied in SMEs as a starting point in lean programs. However according to the literature, mapping the value stream is considered to be the primary tool to be used (National Research Council Canada, 2004). The reason for employing the 5S prior to the value stream mapping is due to the simplicity and the low investment required for its application. This ultimately provides a clean and standardized environment within the company in which the non-value adding activities can be easily identified and eliminated. After applying 5S systems to a satisfactory level, value stream mapping can be initiated. This tool allows the company to develop a clear image of the value stream and identifies the potential bottlenecks that are likely to occur within the processes. This can be achieved using various methods such as the process activity mapping, supply chain response matrix, production variety funnel, quality filter mapping, demand amplification mapping, decision point analysis, and physical structure volume and value (Taylor & Brunt, 2001).

Consequently the non-value adding activities are identified. This can also be achieved using quality circle, which is a group of employees that work together under the supervision of their leader to identify and solve the issues related to the manufacturing processes and report them to the organisation management to overcome and improve the production performance. One of the non-value adding activities, which were found to be the most common among the visited companies, was the excessive material handling and the set up time. In order to reduce such inefficiencies, it is important to list every set up required during the production and measure the times spent on each of them. Moreover the external and internal setup times should be identified. After doing so, the internal setups can be converted to external ones. The overall reduction can be illustrated using the setup reduction graph, which compares the result before and after applying the setup time reduction tool.

Another critical aspect in lean manufacturing is the ergonomic and the health and safety of the workplace. The principal aim of the ergonomic is to provide a suitable condition for the staff in their working environment. This would depend on the characteristics of the employees and the area that they work in. Therefore in any of workstation within the production line, it is important to ensure that any unnecessary movements are prevented by keeping the handling range as short as possible. This would result in increase in productivity of the employees since it avoids fatigue in the work place (ITEM, 2010).

V. CONCLUSION

This investigation was undertaken to assess the applicability of the lean manufacturing techniques within Iranian SMEs and identify the potential barriers for implementation of these tools. The findings suggest that in general, the lean manufacturing tools are not fully developed within SMEs in Iran. Hence there were number of obstacles identified towards leanness of the organisations. The following conclusions can be drawn from the present study.

This study shows that the barriers to implementation of lean program can be classified into four categories. These categories are lack of top management support, financial capabilities, employee skills and expertise and organisational culture. After identifying these barriers, a reasonable approach was then developed to address these obstacles. The finding of this research suggests that the lean implementation can be achieved in two stages. The first set of recommendations is to provide an appropriate lean environment in the organization. In order to do so the managers are responsible to educate every members of the organization about the concept of lean manufacturing by providing formal and informal training.

In addition as part of the management responsibilities and cultural platform, it is important to ensure a no-blame environment in which the mistakes are approached as an opportunity to learn more about the elimination of the potential causes. Another step towards a lean environment is to arrange regular meetings to discuss the new ideas and provide a clear vision. In the second set of recommendations, a range of feasible tools were suggested. The first step was to integrate lean principles in product design phase eliminating potential wastes. This was followed by the consideration of cell manufacturing, pull system, Kanban systems, one-piece flow and poke-yoke methodologies in factory layout design stage. Subsequently, tools such as 5S, value stream mapping, quality circle, work place ergonomic and health and safety can be applied once the company is about to start the production.

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Assessing the Impact of information Exchange, Forecasting and Revenue Sharing Agreements in Partnership Revenue Management: An Application of Airline Planning and Operations Simulator (APOS)

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I. INTRODUCTION

Alliances between airlines on international markets has been a dominant feature of the industry, with alliances carrying more than 60% of the total scheduled traffic (IATA^[1] WATS^[2] report 2016). Global demand data shows that code share traffic has increased by more than 40% between the years 2010 and 2014. Multi-airline marketing partnerships are important in a modern airline's strategic toolkit. By joining a large airline alliance an airline can vastly expand the network where it provides services, in addition to the benefits of getting more flow passengers on its operating network from the alliance partners. Code sharing alliances can produce 50 percent or more of the full revenue benefits of an actual merger with

significantly less investment and risk (Vinod, 2005). The alliance between Northwest and KLM airlines in 1991 had shown how airlines can benefit from strategic marketing partnerships. Northwest's connecting traffic with KLM increased by 115% from 1991 to 1994 adding an estimated revenue of US\$ 125 million for Northwest and US\$ 100 million for KLM in 1994 (Vinod, 2005).

Alliances have been expanding their reach by covering destinations not covered by own network through alliance partners. Table 1 summarizes the key performance measures of global alliances. Even more tightly integrated than alliance members are airlines in equity partnerships and Joint Ventures that involve antitrust immunity and make it possible for partners to engage in highly coordinated pricing, marketing and revenue accounting practices (Ratliff & Weatherford, 2012).

Operating in a partnership requires airlines to integrate their operations and systems in order to enable the seamless experience expected by the customers. State of the art technology focuses on integrating operations across alliance partners like interline ticketing, baggage handling and loyalty programmes. Academia and the industry are now gearing up to address the challenges of integrating the strategic and tactical planning across the alliance partners. Optimal integration would need airlines to behave as a single virtual airline by sharing inventory control, network planning and capacity allocation. An optimal revenue management system would sit on a single combined source of information which provides schedules, fares, revenue accounting and PNR^[5]/Bookings information for both the airlines (Vinod, 2005). This optimal "know-all" solution will be referred to as joint revenue management system. However, such a tight integration system might not be feasible for a multitude of reasons including alliance exit options available to the airlines.

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Table 1: Key performance measures of Global Alliances

	Star Alliance	Sky Team	One world	Other alliances and Individual Airlines
# Of Members	27	20	14	78
Annual Passengers (Million)	641.1	665.4	557.4	1706.1
% RPK ^[3] Flown (%age of total)	23	20	18	39
# Of Destinations Flown	1330	1062	1016	475

A more realistic approach is to have a loosely coupled, decentralized system which allows real time information exchange enabling the individual systems to make decisions while being aware of the entire alliance network. In such an environment each airline will implement its own revenue management and inventory control system. However, a communications framework will allow the individual system to request and receive required information in real time, enabling decisions that are beneficial for the entire alliance network. The environment will prompt a shift in the decision making process from a greedy approach where each airline is focused on optimizing their own network to a more collaborative approach where the benefit of entire alliance is preferred. Fundamental operational requirement for airlines participating in an alliance is to facilitate code share bookings (where one airline sells tickets on a sector operated by the partner). Alliance partners need to exchange operational information like availability, PNR and baggage details in order to ensure code share bookings are appropriately handled. Further, alliance partners can exchange data like the current bid prices on various legs that can help an alliance-aware system make strategic decisions keeping in mind the entire alliance network.

Prior work in the area of airline partnerships have suggested mechanisms for better integration of systems and decision making to achieve the revenue opportunity provided by a joint revenue management system. The inherent assumption here is that the overall alliance benefits are not biased and are beneficial for the participating airlines too. This paper leverages simulation as a tool to quantify the impact of the suggested mechanisms on real airline networks working in partnership. Scenarios simulated in the paper traverse the path of maturity that partnering airlines can take to capture the revenue opportunity space between current state of minimum integration and the optimal State of a joint revenue management system and quantify the revenue impact of every step along the path.

The remainder of the paper has been organized as follows. Section 2 provides the details of prior work done in this area including some of the common practices already adopted by alliances. Section 3 lays down the foundation for the motivation and the need for conducting simulation studies on real alliance data to compliment prior work. Section 3 also deep dives into the details of various integration mechanisms and explains the choices behind the scenarios that are simulated and outlines an integration maturity order within these scenarios. Section 4 provides an overview of Airline Planning and Operations Simulator (APOS), the tool used for simulation. Section 5 provides an overview of the combined alliance network that is simulated and presents some key statistics describing the network. Section 6 gives the details of each scenario that is simulated including the information exchange, forecasting and optimization techniques and the revenue sharing mechanism used in each simulation study. Section 7 first presents the results from each individual simulation study and then moves on to provide a consolidated outline of revenue gain. Section 8 concludes with a recommendation for airlines on integration areas that need to be addressed first. Section 9 provides a glimpse of future simulation work that can be done and some of the gaps with the present study that need to be addressed

II. PRIOR WORK

Prior work has addressed different aspects of Partnership Revenue Management, including the need for synchronized decision making, the infeasibility of a centralized revenue management system (Vinod, 2005), impact of various revenue sharing methods on the overall profitability of the alliance (Belobaba & Jain, 2013) and strategies for real time information exchange in a decentralized environment (Ratliff & Weatherford, 2012).

Alliance Revenue Management (Vinod, 2005) provides an in-depth discussion on challenges faced when trying to synchronize decision making across an airline alliance in order to maximize revenue across the

alliance network. The paper underlines the fact that alliances will remain the prevalent mechanism of co-operation between international airlines due to sovereignty and nationalist issues. An optimal environment for combined revenue management of the alliance is outlined i.e. a single inventory control environment for all partners in an alliance which is aware of the details of the combined network. The paper further establishes the fact that such an optimal environment is far from reality due to several factors like alliance exit options, revenue sharing and anti-trust immunity considerations. A more realistic approach is defined where the alliance partners exchange inventory availability and bid prices in real time on a need to know basis in order to maintain network equilibrium. A detailed treatment of operational and strategic challenges for alliance partners is provided including alliance pricing, through check-in, PNR-synchronization across partners and combined overbooking policy.

Simulation results from PODS^[6] simulation framework showcasing the benefits from sharing of bid prices between the partner airlines and using the bid price of the partner airline within the optimization have been presented (Belobaba & Jain, 2013). Two important aspects of Alliance Revenue Management are covered. The first being determination of seat availability based on revenue benefit and opportunity cost for the alliance using shared bid price from the alliance partner. The second is using information (bid prices) about the current state of the alliance partner during the optimization process in order to set the optimal controls that will optimize the entire alliance network.

Codeshare and alliance revenue management best practices: AGIFORS^[7] roundtable review (Ratliff & Weatherford, 2012) gives a practitioner-oriented review of the problems. Opportunities and best practices associated with code share and alliance revenue management have been presented based on a round table discussions with operations research experts and airline RM practitioners. The paper provides details on the code share inventory control mechanism, revenue sharing agreements in widespread use by the alliance partners along with the details of approaches used by airlines to curb the biases built in proration methods (for example mileage based proration favors the long haul carrier). The paper discusses the superiority of free-sell availability agreements which does not impose a pre-specified limit on the number of seats allocated to the marketing airlines, instead uses a dynamic approach for seats sharing. A section is dedicated to the alliance revenue management best practices with emphasis on dynamic proration mechanisms advocated by several authors and in early adoption stages by a few airlines.

III. MOTIVATION

There are three major aspects of integration systems that come to the fore, based on a study of the previous work in the area of alliance revenue management and current practices at various airlines: inventory information exchange, decision making and revenue sharing.

a) *Inventory Information Exchange*

The alliance partners need to integrate their inventory systems and exchange availability information. This enables the partner airlines to sell tickets of on sectors operated by the other. This is typically the first level of maturity in integration without which the airlines will not be able to effectively sell code share itineraries.

b) *Decision making*

The revenue management systems should be enabled to consider the true origin and destination demand and revenue proration to make informed decisions while allocating seats in order to maximize the revenue. This requires all the alliance partners to exchange complete itinerary information with each other instead of sharing only the portion operated by the airline. Knowing the entire code share itinerary allows the alliance partners to estimate and forecast demand appropriately. This is the next level of maturity in integration after crossing the first level of inventory information exchange.

c) *Revenue sharing*

The alliance partners need to decide on revenue sharing for code share itineraries so that the individual airline revenue maximization goals are aligned with the alliance revenue maximization goal. Dynamic proration mechanisms suggested in prior work require the airlines to exchange bid price information in order to allow revenue split based on the state of the airline at the time of sale. This is the final stage of maturity in integration as it requires a major level of trust among partners and deeper level of integration like between Lufthansa and Swiss or between KLM and Air France (Hu, Caldentey, and Vulcano, 2013)

The motivation for this study is to put a realistic estimate on the revenue gain that practitioners can expect by adopting the integration mechanisms described in prior work. The earlier studies either did not perform a simulation to measure the impact of suggested strategies or performed it on a sample artificial network. The main contribution of this study would be to estimate the revenue impact after running simulation on a large realistic network created from data obtained from actual partner airlines and also provide a path of maturity in integration to follow that can help close the revenue opportunity gap between completely decentralized and centralized systems. Airline Planning

and Operations Simulator (APOS) is used for the simulation studies.

There are two sets of variations introduced in the simulation:

Maturity of integration: Several mechanisms that represent maturity of integration are simulated. These mechanisms have been defined in the further sections

Code share Factor: The code share factor controls what percent of the total traffic is on code share. This variation is used for analyzing sensitivity of revenue impact to the level of code share traffic carried by the network

Based on the three aspects of systems integration discussed in this section, three stages of integration maturity are defined as shown in Figure 1:

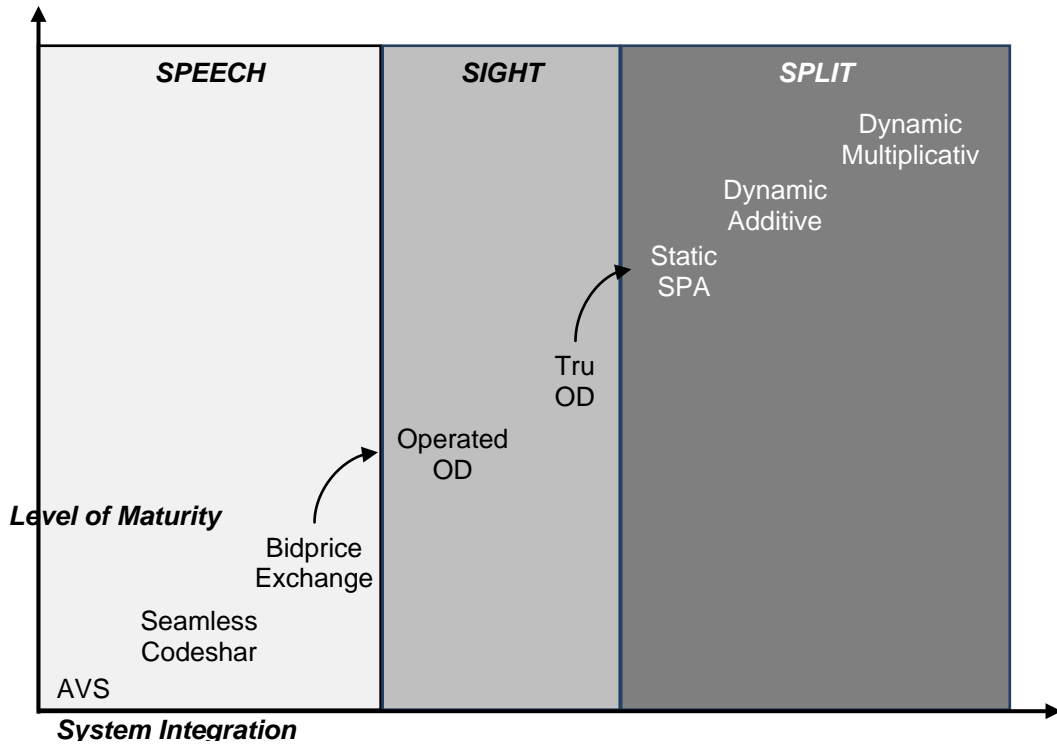


Figure 1: Partner systems synchronization –Levels of maturity

The speech stage addresses the operational aspects of the systems integration within an airline alliance which primarily revolves around the mechanism of sharing availability information. This is referred to as the speech stage because this is primarily the way IT systems talk to each other and convey information. The sight and split stages address the more strategic issues related to setting of inventory controls and the mechanism of sharing revenue on ticket sales on code

share itineraries. The sight stage covers strategies related to forecasting and optimization in the individual revenue management systems of the alliance partners and whether these individual systems are aware of the partner and code share itineraries. The split stage covers the mechanisms of revenue sharing. These stages are described in more detail using the code share itinerary example in Figure 2:

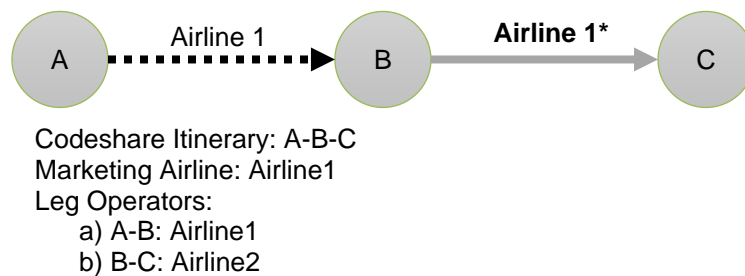


Figure 2: Sample code share itinerary

d) *Speech: How do partners communicate their availability status to each other?*

In a partnership scenario, one airline is allowed to market tickets on another airline and also sell code share itineraries where different segments of the itinerary are operated by different airlines (See Figure 2). While evaluating such requests, the marketing airline needs to know the status of the seats available on the operating airline. The operating airline can share different levels of data with the marketing airline regarding status on whether a seat is available on the requested flight and how valuable those seats are. The different kinds of inventory information exchange mechanisms that are simulated are:

AVS: AVS stands for Availability Status Message or Availability Inventory Status message which is an IATA standard Teletype message transmitted from one airline

to another or to a CRS^[8]/GDS^[9] in order to update its Flight's availability on other airline or GDS core availability. Operating airline would exchange AVS message with the marketing airline(s) which processes the AVS messages and stores the availability matrix of on the flights operated by their partners (see Figure 3). When the code share sale request is received by an airline, it will refer to this locally stored availability matrix before accepting or rejecting the request (see Figure 4). AVS messages are usually transmitted as a result of changes in status when availability crosses pre-defined level of availability threshold. Due to these thresholds and lag in transmission of AVS message, code share requests can get rejected even when seats are available on the operating carrier or lead to unintended over sales for the operating carrier.

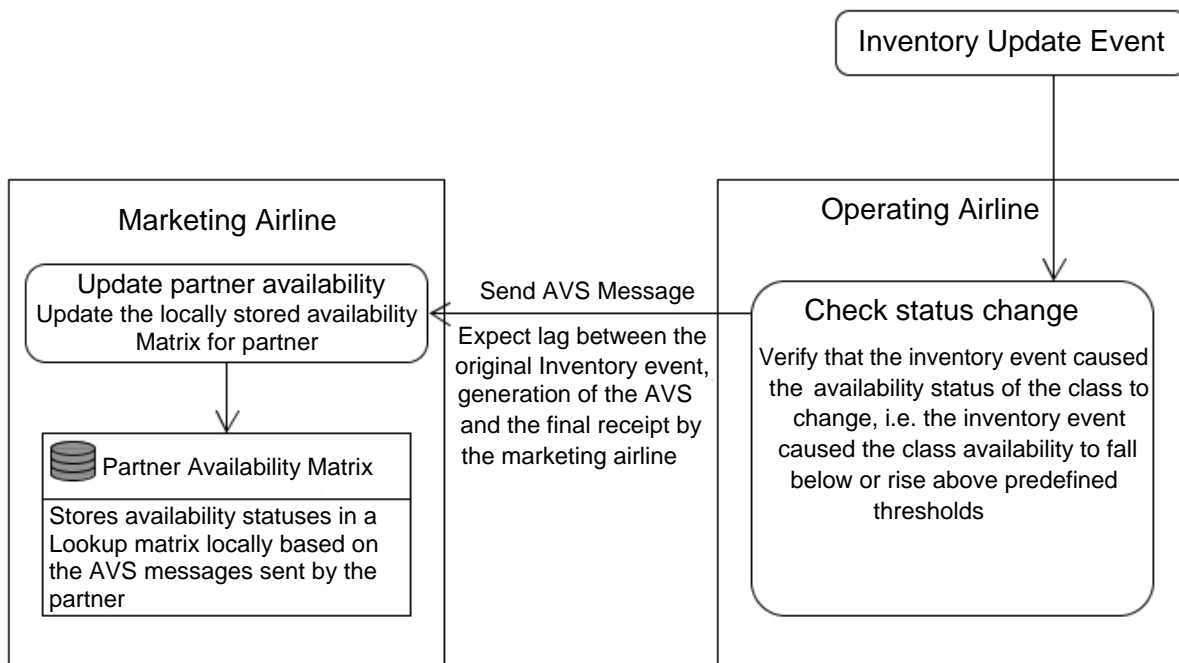


Figure 3: AVS Exchange

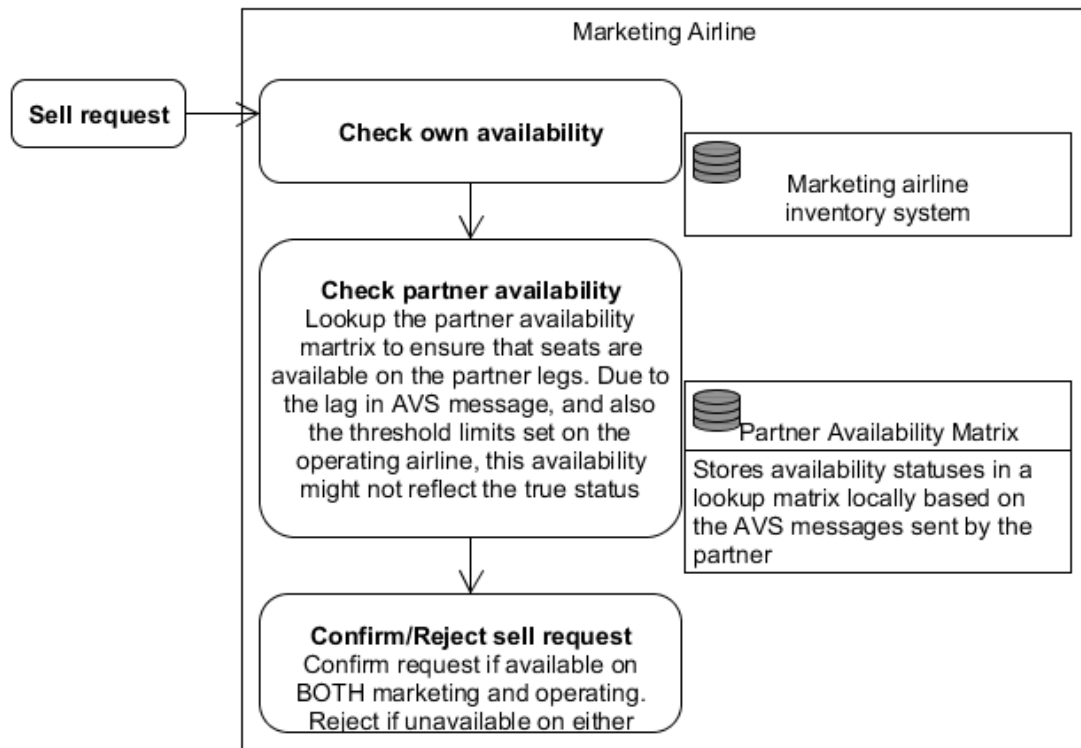


Figure 4: Code share evaluation based on AVS exchange

Seamless Code share: Seamless code share enables the carriers with interactive availability and sell capabilities with their partners hosted in other systems. It also provides code share partners with last seat availability and immediately decrements the sell rather than relying on AVS availability and code share guaranteed teletype sell action codes. Figure 5 outlines the code share request evaluation process in Seamless

Code share. Seamless code share simulated in the study is cascading without journey data. This means the marketing airline has the entire O&D information and hence can evaluate availability of own leg by comparing bid price and prorated O&D fare but operating partner responds with leg class financial availability based on local fare.

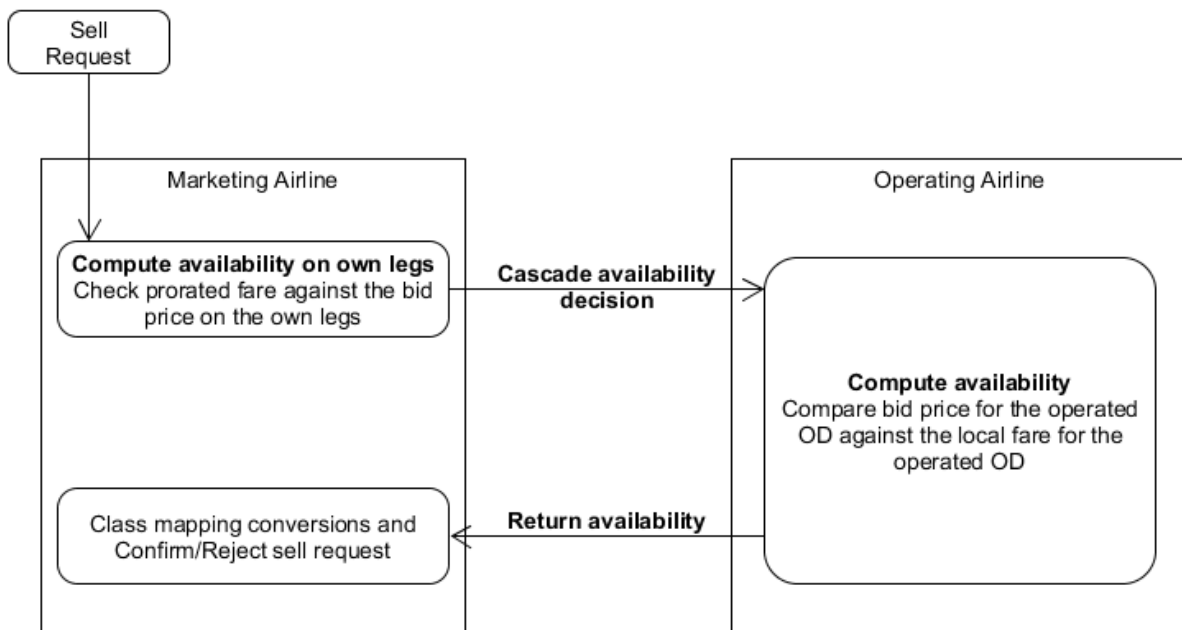


Figure 5: Seamless code share availability calculation

Bid Price Exchange: Carriers can make more optimal inventory decisions at the O&D level if they evaluate the availability using the O&D fare and the bid prices of all the underlying legs (including that of the operating carrier). This will enable right availability value to be used at the time of sale in an O&D environment. Bid price exchange allows operating carriers to push bid price

vectors of the legs operated by them to the marketing airlines. These bid price vectors are stored and processed by the marketing airlines at the time of availability determination. Figure 6 and Figure 7 outlines the details of the exchange mechanism and request evaluation.

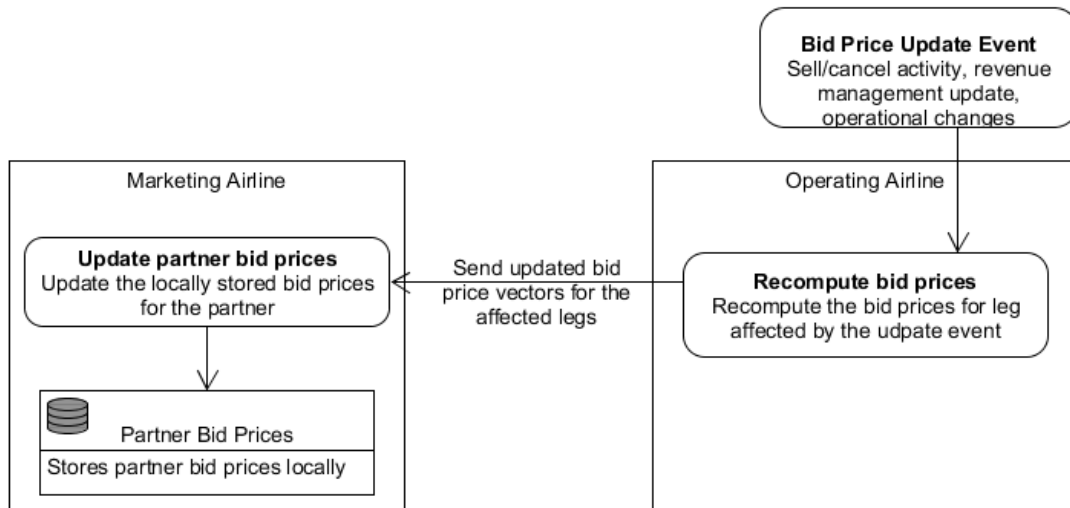


Figure 6: Bid price exchange mechanism

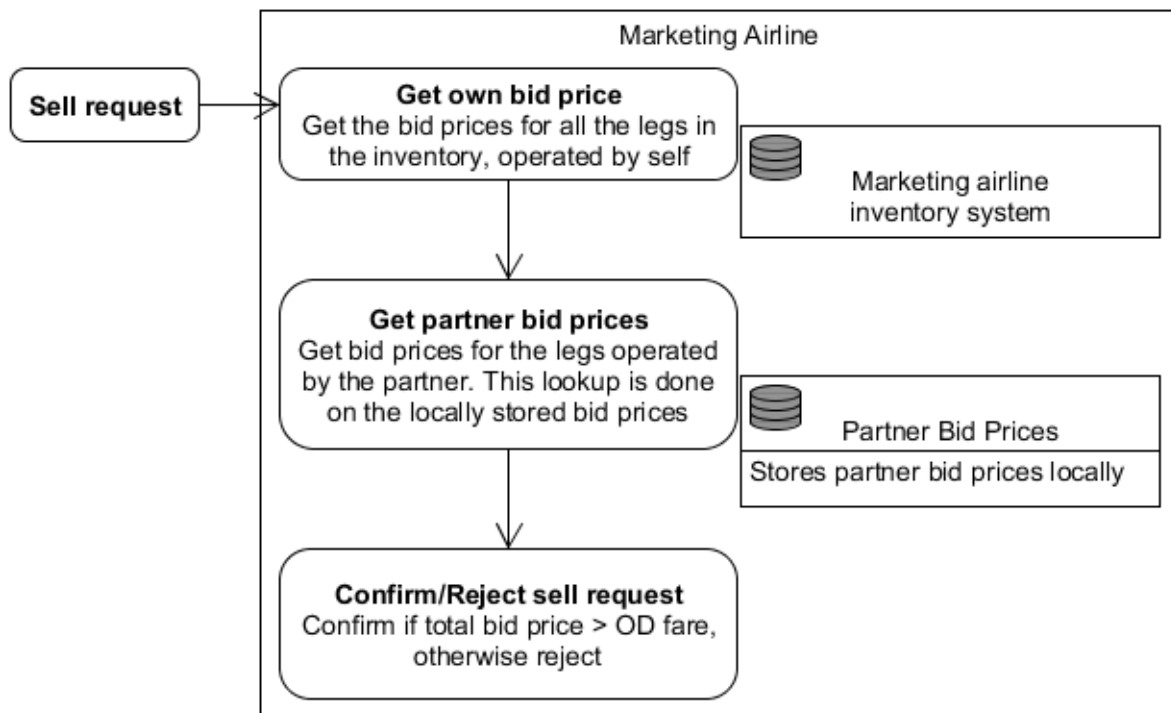


Figure 7: Code share itinerary evaluation using bid price exchange

e) *Sight:* How far can the partner see during forecasting and optimization?

The maturity of the partners in terms of information they are able to see determine whether the forecasted demand and revenue value of the demand is of the Operated O&D or True O&D.

Operated O & D: Each partner airline has information only about the operated portion of the code share itinerary. Hence the code share demand is forecasted as operated O&D demand and the fares filed for the operated O & D is considered as the revenue value of the demand in optimization.

True O&D: Here the airlines have complete information about the entire journey made by the passengers. Hence operated O&D passengers can be differentiated from code share passengers and forecasted separately. Information on revenue sharing agreements is used to estimate proration factor to be applied on True O&D fare to consider the right revenue value of the demand in optimization.

f) *Split: How the revenue from code share itineraries is split between the partners?*

Once a seat is sold on the code share itinerary, the involved airlines (marketing and operating) need to split the revenue between themselves. The revenue sharing agreement should ensure fair share for each airline. Following revenue sharing schemes are considered for the study:

Static: Static methods split the revenue between the partners based on a pre-decided mutually agreed ratio. This could be based on local fares of partners, or cost weighted mileage. Airlines also sign a Special Proration Agreement (SPA) which defines the revenue split ratio. The static proration methods do not take into account the real time dynamics at the time when the sale request is confirmed. Proration ratios obtained from real data of the partner air lines are used for the study.

Dynamic: Although static methods are the prevalent method of sharing mechanism between partners,

academic research suggests dynamic revenue sharing schemes (Wright, Groenevelt, & Shumsky, 2008) as a more optimal way of splitting revenue between the partners. Dynamic methods vary the revenue proration ratios for each seat sold based on the state of the leg cabins on the code share itinerary at the time of the sale. Within dynamic revenue sharing schemes, two variants are used in the simulation.

a) *Additive:* The operating airline gets the current bid price at the time of sale, the rest goes to the marketing airline

b) *Multiplicative:* The revenue is shared between the airlines in the ratio of the bid prices

The experiment design moves along each stage keeping everything else constant and just varying the options available in the given stage. There is an inherent order in the stages defining a chain of maturity which is speech, sight and then split. As the experiments move into the higher stage of maturity, the 'best case' settings from the previous stage are retained. This is done in order to isolate the impact of variations in each stage.

IV. APOS

The APOS framework enables simulation on top of real historical data provided by an airline. APOS modules are outlined in Table 2. The main modules of interest for this study are:

Table 2: Main modules of the APOS framework

Reader	Event Generator	Models Engine	Evaluator	Reporter
Reads all the input files, including: <ol style="list-style-type: none"> 1. Historical demand 2. Network 3. Fares 4. Capacity 	Generates randomized future event based on the historical events. This include: <ol style="list-style-type: none"> 1. Booking Requests 2. Demand Volume 3. Arrival Patterns 	This is core of RM engine. It includes models for: <ol style="list-style-type: none"> 1. Network Optimization 2. Leg Optimization 3. Rules Engine Different models can be plugged here and APOS provided several pre-defined choices	Evaluator will process the request events and accept or reject them based on: <ol style="list-style-type: none"> 1. Economic and Physical control policies 2. Nesting structure of classes 3. Information exchange between partners Evaluator also simulates spill and recapture	Reporter writes out detailed information about each event that occurs within the simulation. This enables: <ol style="list-style-type: none"> 1. Analysis of simulation results 2. Drill-down reporting 3. KPI Reporting – RASK, Revenue, Load Factors

Event Generator: Incoming passenger requests are generated based on historical booking volume data of partner airlines. Arrival patterns are derived from industry data on markets simulated.

Models Engine: Average O&D demand forecasted by revenue management systems of individual airlines. Based on the maturity level of the revenue management system, this module can forecast only operated O&D

demand or true O&D demand. Each individual airline optimizes own revenue based on information available.

Evaluator: Request evaluation by the inventory systems of the airlines based on the information available on own and partner inventory.

Reporter: Accounts for Special proration and dynamic proration agreements in computing revenue achieved by each individual airline. Computes key performance indicators like Yield, Load factor, Code share and flow percentage

The APOS framework simulates several streams of incoming passenger requests that mimic different instances of a typical 24-hour window of departures on the airline networks. APOS also has the capability to simulate higher demand on code share itineraries for sensitivity analysis.

V. SIMULATION SETUP

Real data obtained from two alliance partners is used in simulation in order to have a realistic estimate of the revenue impact. For the sake of present study, the airlines will be called Airline1 and Airline2. Airline1 is a pure hub and spoke carrier which serves international markets. Major portion of Airline1 traffic is flow traffic moving through the hub to their eventual destination. Airline2 is a major regional player with only a few long haul routes. The partnership allows Airline1 to expand its network in the region where Airline2 operates and helps Airline2 provide several international connections from its regional airports.

A representative sketch of the combined network of the partners is as shown in Figure 8:

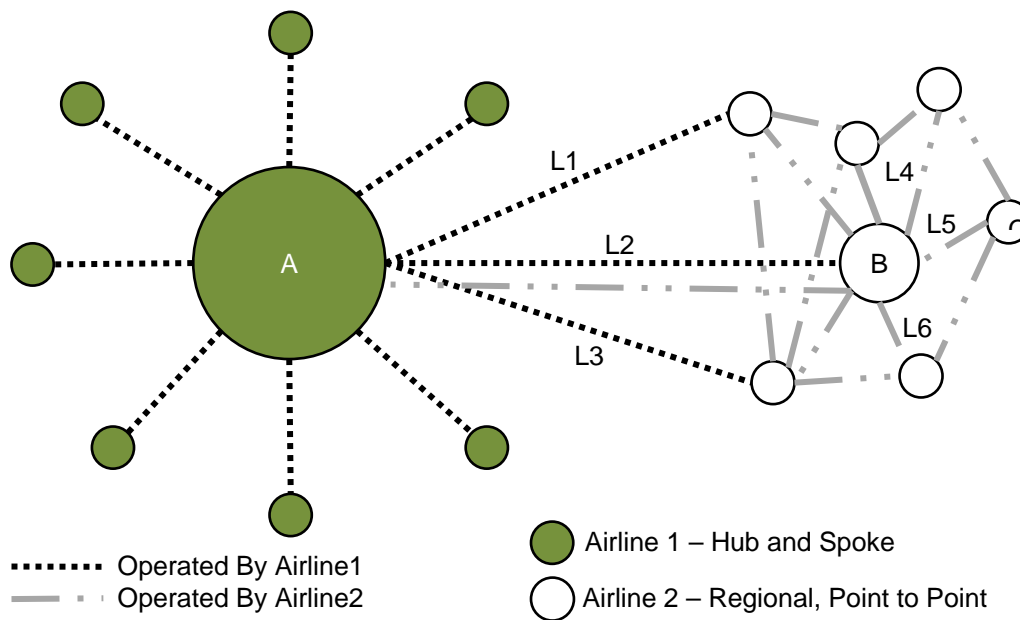


Figure 8: Combined network of the partner airlines

Some key statistics about the airlines involved in the partnership are as shown in Table 3:

Table 3: Key information about the airlines in the partnership

Airline1	KPI	Airline2
Hub and Spoke	Network Type	Point to point
200	Flights	700
800	Markets	1,200
1,000	Itineraries	2,500
22,000	Bookings	75,000
40,000	Capacity	100,000
16%	Code share Demand %	3%

The code share demand on the network can be divided into three different categories:

Table 4: Code share categories

Type	Representative Itinerary	Key features	Benefits
Parallel	<p>A-B</p> <p>L2 Marketed by: Airline1 Operated by: Airline2</p> <p>L2 Marketed by: Airline2 Operated by: Airline1</p>	Code share on routes operated by both airlines (usually trunk routes). Entire itinerary operated by single airline. Sales agreement to allow partner to sell tickets Revenue sharing based on pre decided commission rates. In this sample both Airline1 and Airline2 offer services on the leg L2, however they allow each other to sell tickets on the shared sectors. Airline2 might not have many services offered on L2 while Airline1 might	Increased frequency on trunk routes
Complimentary	<p>A-B-C</p> <p>L2 + L5 Marketed by: Airline1 Operated by: Airline1+Airline2</p>	Itinerary is jointly operated by partners. Itinerary not serviceable by either airline alone. Revenue sharing based on the portion serviced. The sample itinerary L2+L5 creates a service from station A to C via B. This allows both the airlines to expand their network to stations that they are not able to service on their own network	Better network coverage
Virtual	<p>B-C</p> <p>L5 Marketed by: Airline1 Operated by: Airline2</p>	Entire itinerary operated by single airline. Service on non-shared routes. Revenue sharing based on pre decided commission rates. Here L5 sector is operated only by Airline2, however Airline1 is able to sell tickets on this sector because of the ticket sales agreement	Better network coverage

The sample network selected for the study contains code share itineraries of all the three types along with non-code share itineraries which are marketed and operated by a single airline. Airline1 has a large chunk of code share demand as can be seen in the key information about the alliance network in Table 3.

VI. EXPERIMENT SETUP

Three sets of experiments are conducted, one along each stage of maturity as explained before. The experiments move along one stage, while keeping the previous stage constant at the best level in order to allow isolation of the effect of the variant stage.

First the experiments move along the speech stage as it is the fundamental requirement for alliances to allow code share bookings. Once the best strategy to communicate inventory availability information is

identified, the speech stage is fixed with the best strategy and the experiments move along the more strategic sight stage and measure gain from forecasting and optimizing true ODs as against forecasting and optimizing only the operated ODs. Finally the speech and sight stages are fixed at their best alternative and the experiments move along the split stage to find out the best mechanism of splitting the revenues amongst the partners and measure expected gain from different revenue sharing mechanisms. Finally, the simulation of a virtual single airline that includes the network of both the airlines where inventory decisions are made using centralized revenue management and inventory systems provides an upper bound on the alliance revenue (Vinod, 2005) to assess the revenue opportunity gap between centralized and decentralized systems that is captured by integration mechanisms.

In all the experiments conducted the following forecasting and optimization model sare used:

Table 4: Experiment setup, forecasting and optimization

	Forecasting	Optimization	Inventory Control
Airline 1	Average The demand forecast is an average of historical OD demand	Network - DLP-OD Leg - EMSRb with displacement adjusted fares	Bid Price Control Request is evaluated based on financial controls
Airline 2			

Using the same forecasting and optimization methods across ensures that the differences seen in the alliance revenues can be attributed to changes in the integration and revenue sharing methods. The Table 5 shows all scenarios that are simulated in the increasing order of maturity stages. The base case used for each

stage is highlighted. It is important to note that there is an inherent order in the way the experiments move through the stages from operational to more strategic levels. The best case from each stage is retained when moving to a higher stage.

Table 5: Experiment sets in increasing order of maturity level along the three stages

Maturity Stage	Forecasting	Optimization	Evaluation	Revenue Sharing Mechanism
Speech	Operated OD	Operated OD No Proration	AVS	SPA
			Seamless Code share	
			Bid Price Exchange	
Sight	Operated OD True OD	Operated OD No Proration	Bid Price Exchange	SPA
		True OD No Proration		
Split	True OD	True OD Prorated Fares based on SPA	Bid Price Exchange	SPA
		True OD Prorated fares based on previous optimization bid prices	Bid Price Exchange	Dynamic Additive
				Dynamic Multiplicative
Joint Revenue Management	No integration mechanisms are required here, as the simulation treats the entire network as a single airline which is aware of all information required			

The details of the three sets of experiments are as follows:

a) The Speech Stage

The set of experiments in the speech stage study the value gained with higher level of integration and information exchange between inventory control systems of the partner airlines. The forecasting, optimization and revenue sharing between the partners

is kept constant, while the availability information exchange methods are varied.

AVS exchange is treated as the as the base case and the revenue gain that can be achieved by implementing seamless code share and bid price exchange is estimated. Table 6 outlines the request evaluation method in each of the three information exchange mechanisms for the sample itinerary in Figure 9.

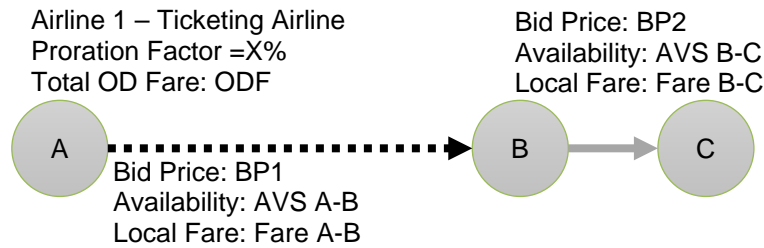


Figure 9: Sample code share itinerary

Table 6: Comparison of various inventory control integration methods

O&D Availability	AVS Exchange	Seamless Code share	Bid Price Exchange
✓	Both AVS A-B AND AVS B-C are true	$ODF * X\% \geq BP1$ AND $Fare\ B-C \geq BP2$	$ODF \geq BP1 + BP2$
✗	At least one of AVS A-B OR AVS B-C is false	$ODF * X\% < BP1$ OR $Fare\ B-C < BP2$	$ODF < BP1 + BP2$

b) *Sight Stage*

The information available to the forecasting and optimization methods is varied keeping the availability information exchange and revenue sharing mechanisms constant. Availability information method is set at Bid Price Exchange which came out as the best mechanism for the speech stage as can be observed in results section later. Revenue sharing mechanism is set to static proration agreements which is the base case for split stage. There are the two cases simulated for sight stage based on visibility of information of partner airlines and utilization of the same in forecasting and optimization:

Operated O&D: The airlines have information only about the portion of itineraries that is operated by them. The fare of the operated O&D is used in optimization.

True O&D: The airlines can see the entire itinerary enabling them to appropriately allocate the passengers to the right O&D for demand estimation and also take proration into account in estimating the revenue value of the demand.

Operated O&D is considered as the base case here to estimate the gain that can be achieved by True O&D forecasting and optimization.

a) *The Split Stage*

Three different revenue sharing mechanisms are simulated: Static, Dynamic Additive and Dynamic Multiplicative keeping the speech stage constant at Bid

Price Exchange and sight stage constant at True O&D forecasting and optimization that turned out to be the best mechanisms for the respective stages as can be observed in results section later. In the split stage, Static SPAs are considered as the base case, as it is a fixed proration across the market and does not consider the situation of the flights at the time of sale for splitting the revenue between the airlines. This method might not be a win scenario for the airline which is running at a higher load factor and thus giving up a more valuable seat for the code share. The other two cases consider the current bid prices of the leg cabins over which the itinerary is flying and split the revenue per code share seat sold, instead of applying a flat proration rate.

The combination of base cases of each stage with AVS used for availability information exchange, operated O&D used for decision making and static revenue sharing scheme for splitting the revenue represents the base state of decentralized systems. An imaginary centralized system where partner airlines operate and control inventory as a single air line is also simulated to assess the revenue opportunity gap between centralized and decentralized systems that the steps in maturity of integration help capture. In addition to the experiments represented in the above cases, sensitivity analysis with respect to percentage of code share bookings carried by the network is also conducted.

VII. RESULTS

This section can be divided into two subsections. First subsection presents the simulation results from the experiments conducted as described in the experiment setup section. The second subsection consolidates the results from various experiments and provides an overview of the revenue gain that alliance partners can expect by adopting better integration mechanisms with partner airlines. The results are presented for the entire alliance and each individual airline in order to study whether the entire alliance is benefiting from the integration mechanism, and whether benefits accrued are biased towards a singular airline.

The possible reasons for revenue gain (or loss) observed are explained through small sample examples. Effects of higher code share traffic flying on the alliance network is also presented.

a) Results for Each Maturity stage

i. The Speech Stage

Significant revenue gain is observed as the systems mature from AVS exchange method for sharing seat availability to bid price exchange for code share request evaluation. The revenue gain is not biased and benefit both the airlines individually, while adding to the revenue of the overall alliance.

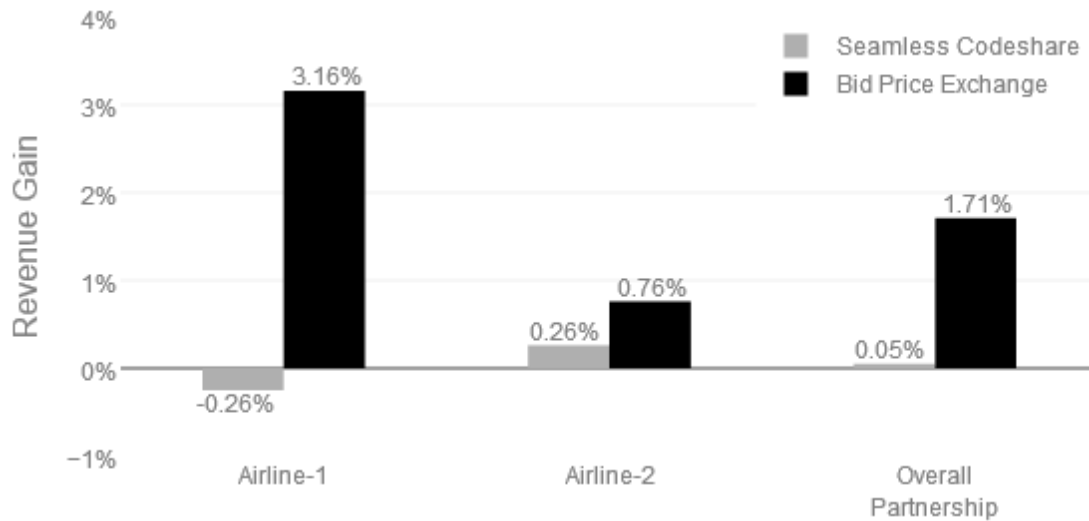


Figure 10: Speech stage, revenue gain over AVS

The seamless code share method produces marginal gain (0.05%) for the overall alliance, while losing revenue (-0.26%) for Airline1 and gaining similar amount of revenue (0.26%) for Airline2.

The bid price exchange method shows a significant gain of 1.71% over AVS for the overall alliance. Both Airline1 (3.16%) and Airline2 (0.76%) gain revenue by using bid price exchange for code share itinerary evaluation. The revenue gain can be attributed to the increase observed in the percentage of code share itinerary booking requests that are accepted. Figure 11 shows that the code share percent almost doubled in the entire network.

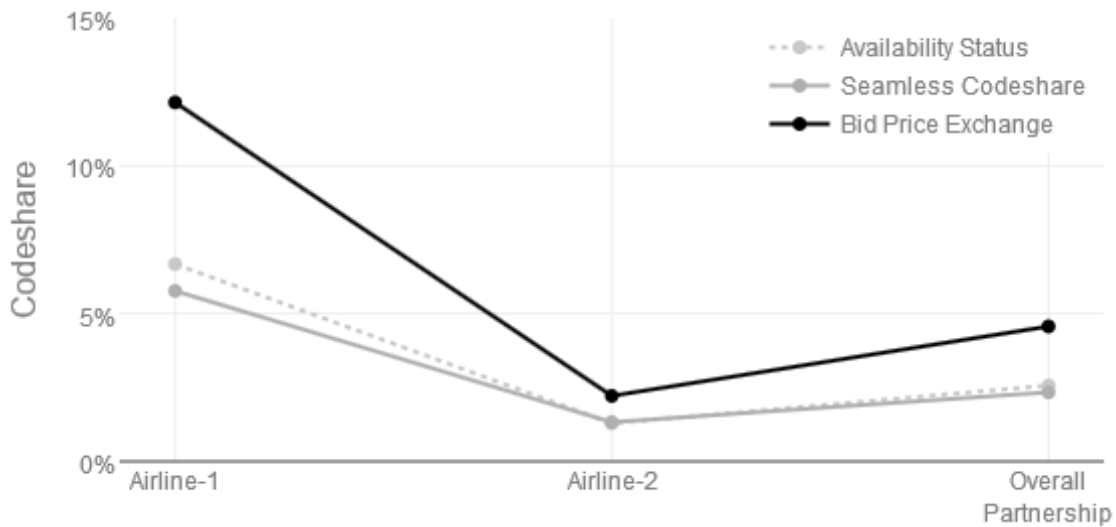


Figure 11: Speech stage, code share gain over AVS

An explanation of the observed increment in the code share traffic can be given by looking at the sample code share itinerary in Figure 12:

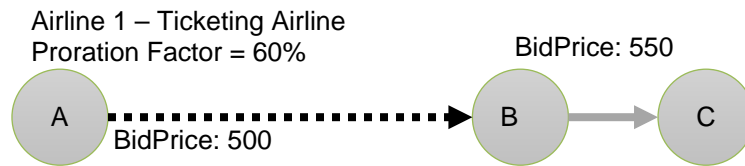


Figure 12: Sample code share itinerary for availability computation

This inter line code share itinerary flies on the market A-C, via station B. A-B is a long haul segment operated by Airline1. B-C is a short haul segment operated by Airline2. The details of availability of these segments is in Table 7.

Table 7: Availability computations for segment A-C

Fare Class	Physical Availability B-C	Fare B-C	Financial Availability B-C	Fare A-C	Airline1 Prorated Fare	Airline2 Prorated Fare
Y	5	700	✓	2000	1200	800
M	2	500	✓	1800	1080	720
B	✗	300	✗	1500	900	600

Availability decisions that will be taken for AC- B class itinerary by the different methods on the speech stage are shown in Table 8.

Table 8: Availability decisions from different evaluation methods

Evaluation Method	Availability Decision For A-C Itin	Reason
AVS	✗	Physical availability on segment B-C would lead to AVS close status, and hence the entire A-C itinerary will be rejected
Seamless Codeshare	✗	Financial availability on segment B-C is not there as the local fare for B-C segment in fare class B (300) is less than the B-C segment bid price (500). Hence the entire A-C
Bid Price Exchange	✓	Total bid price for A-C itinerary ($500 + 550 = 1050$) is less than the fare offered

The prorated fares for Airline1 and Airline2 (900 and 600 respectively) are more than the bid prices for local segments (500 and 550 respectively). Accepting this request is profitable for both the airlines. Bid Price Exchange enables the right tradeoff between operated O&D and code share requests to achieve better revenue for both the airlines and the overall partnership network.

Further, a trend is observed in the revenue gain when increased code share traffic is simulated on the network. This trend is linear gaining 0.6% revenue for each 1% increment in the code share percent.

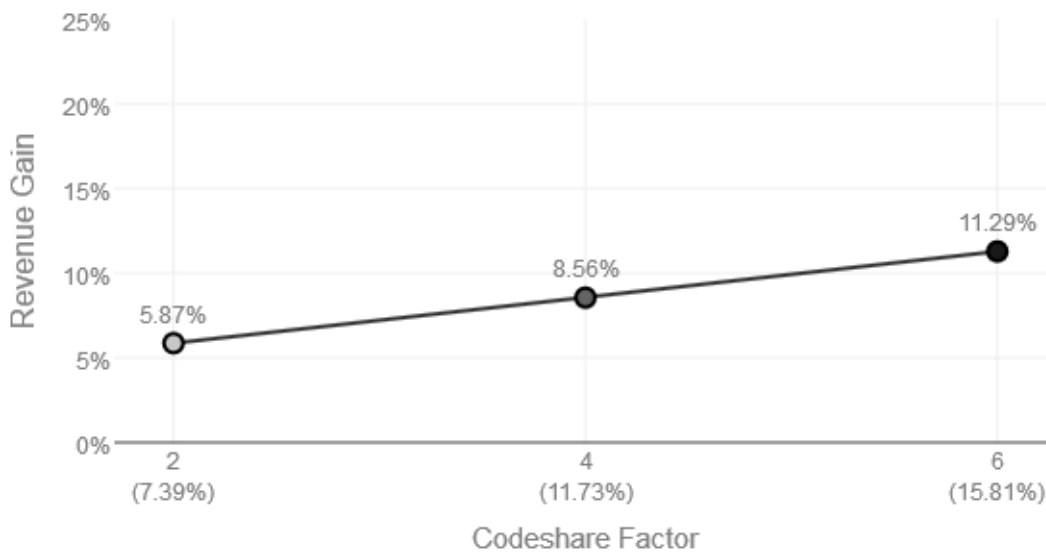


Figure 13: Speech stage, revenue gain trend over AVS for overall partnership

Similar linear trend is observed for the individual airlines. The gain for Airline1 is much higher than Airline 2 due to higher contribution of code share traffic and revenue to the total.

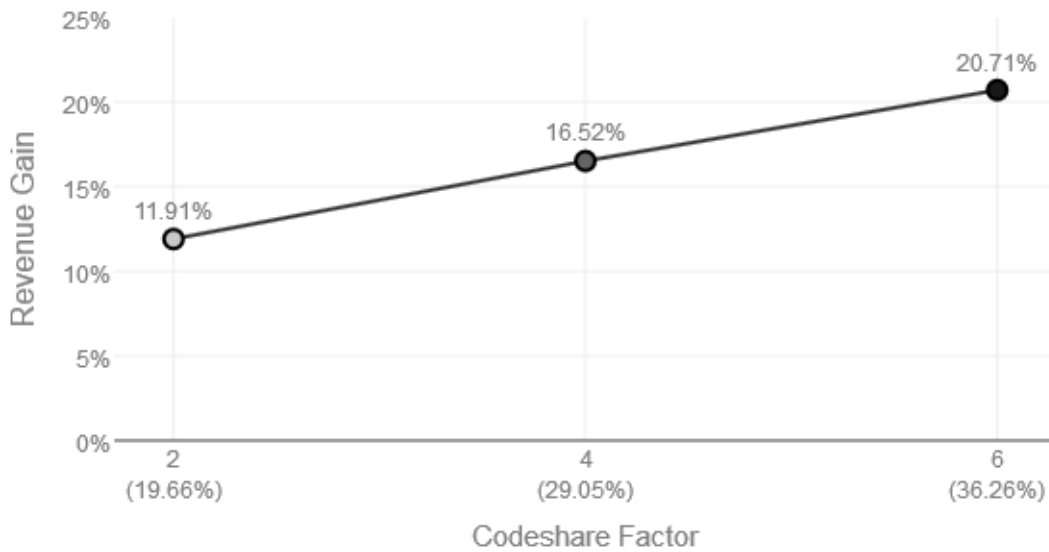


Figure 14: Speech stage, revenue gain trend over AVS for Airline1

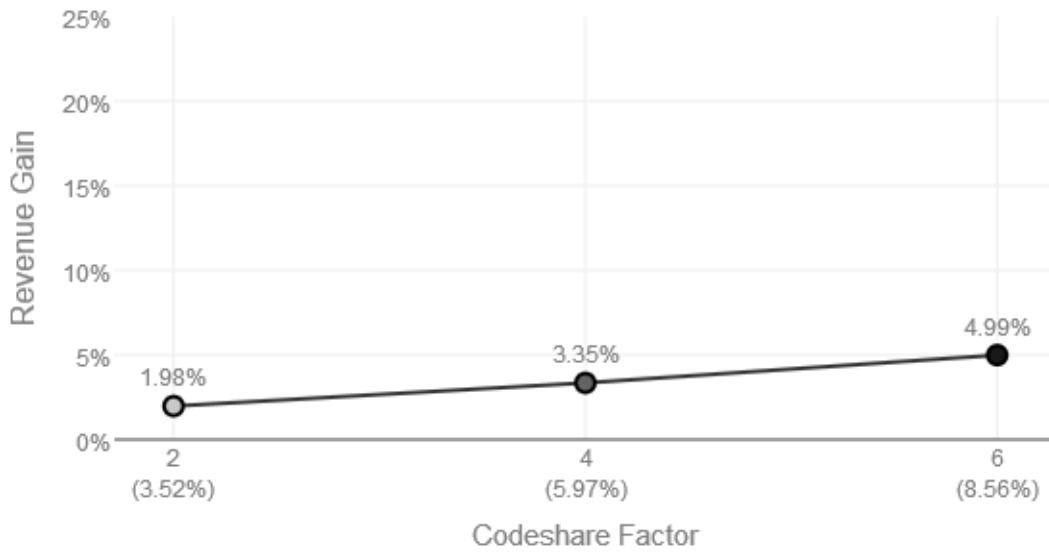


Figure 15: Speech stage, revenue gain trend over AVS for Airline2

ii. *The Sight Stage*

Revenue gain of about 0.57% is observed for the overall alliance when the visibility of the revenue management system for the individual airlines mature from Operated O&D to True O&D. Both the airlines also gain individually, Airline1 gains about 1.18% while Airline2 gains 0.16% revenue.

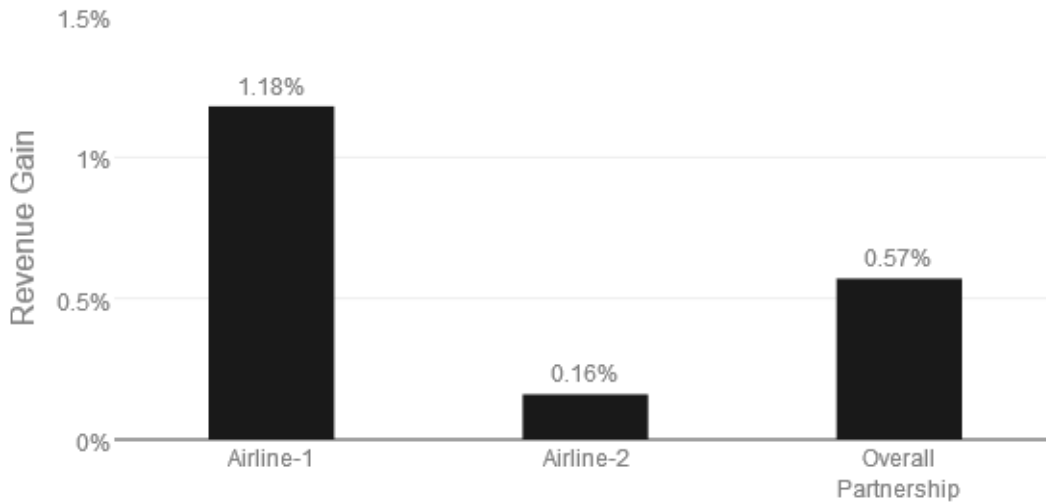


Figure 16: Sight stage, revenue gain over operated OD

Revenue gained over Operated O&D can be attributed to an increase in the number of code share itineraries that are accepted. Since the revenue management systems at both airlines are aware of the True OD of each passenger serviced, the systems can perform an accurate estimation the demand and value of each sector they service. This allows the individual revenue management systems to make a better tradeoff between the online and code share demand.

Figure 17 shows the code share percentage gained by each airline and the overall alliance by using True O&D forecasting and optimization. The simulation results indicate that overall alliance code share percentage increases from 4.6 % to 4.9% but for Airline1 this leads to code share percentage going up from 12% to 13% when the revenue management systems mature from Operated O&D to True O&D forecasting and optimization.

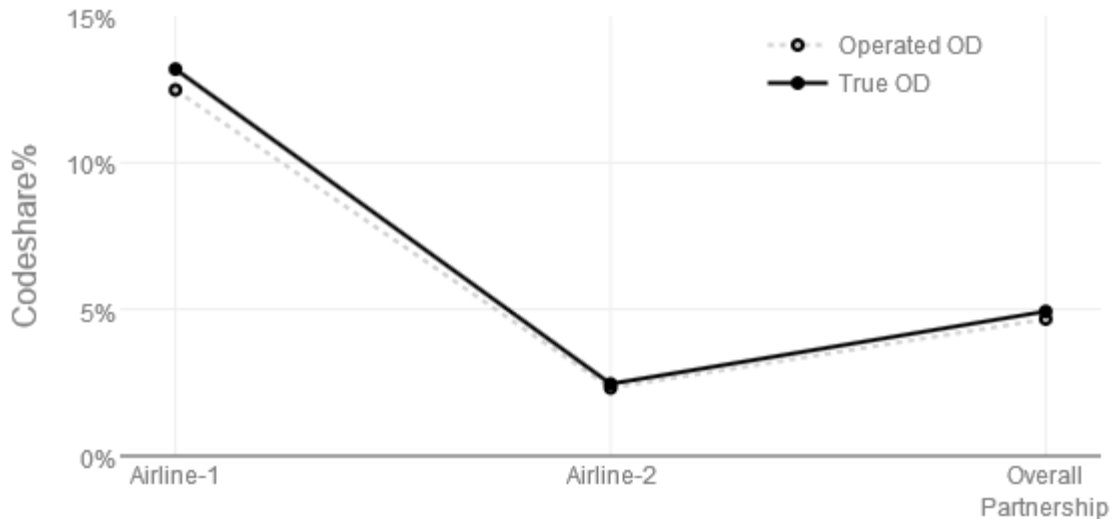


Figure 17: Sight stage, code share gain over operated OD

The revenue gain can be explained by looking at the sample itinerary in Figure 18.

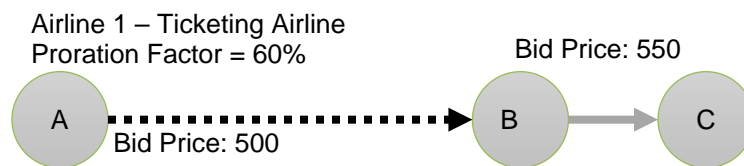


Figure 18: Sample code share itinerary for availability computation

The demand and fares for the various service classes flying over segment A-B in the sample itinerary are shown in Table 9.

Table 9: Fares and true demand for service classes flying over segment A-B

Fare Class	Demand	Fare	Airline1 Prorated Fare (60%)	Allocations
AC - Y	6	1800	1080	6
AC - B	10	1200	720	10
AB - Y	10	700	700	10
AC - M	15	1000	600	15
AB - B	15	500	500	9
AB - M	25	400	400	×

It can be observed that the local fares for M class on segment AB is 400 against the prorated fare of 600 coming from M class on the service AC. In case of forecasting and optimization based on Operated O&D

Airline1 would forecast demand and come up with seat allocations as shown in Table 10. The resulting revenue impact is explained in Table 11.

Table 10: Fares and demand considered by Operated O & D revenue management system for segment A-B

Fare Class	Demand	Fare	Airline1 Prorated Fare (60%)	Allocations
AB-Y	16	700	700	16
AB-B	25	500	500	25
AB-M	40	400	700	9

Table 11: Operated OD v/s True OD

Service - Class	Segment	Method	Revenue Estimate of Flow Demand
AC - M	AB	Operated O&D	Operated OD will estimate this demand at local fare 400. The optimization set lower bid prices and it will lead to dilution of revenue
AC- M	AB	True OD	True OD will estimate this demand using the prorated fare: 600, resulting in higher bid prices. Code share demand providing higher revenue share will be preferred over local demand. Hence true OD helps revenue management systems to increase yield by maintaining better mix of code share and operated market demand

Simulation of scenarios with higher code share demand showed that the benefits from True OD forecasting and optimization will increase linearly with higher code share demand.

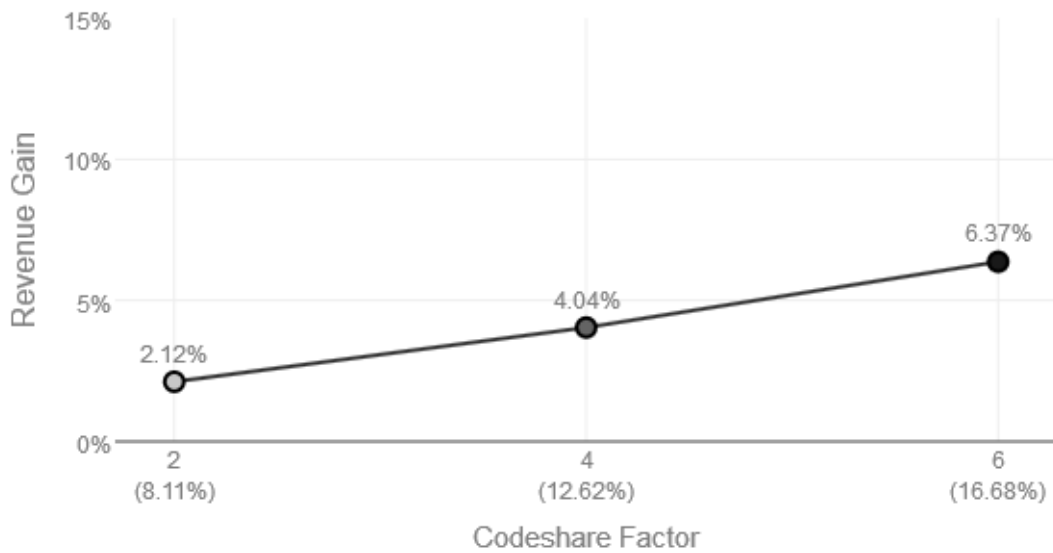


Figure 19: Sight stage, revenue gain trend over Operated O&D for overall partnership

Similar linear trend is found in the revenue gain for individual airlines as the code share demand increases as shown in Figure 20 and Figure 21. The trend is same for both the airlines. However, the gain

observed for Airline1 is higher than Airline2 due to higher contribution of code share traffic and revenue to the total.

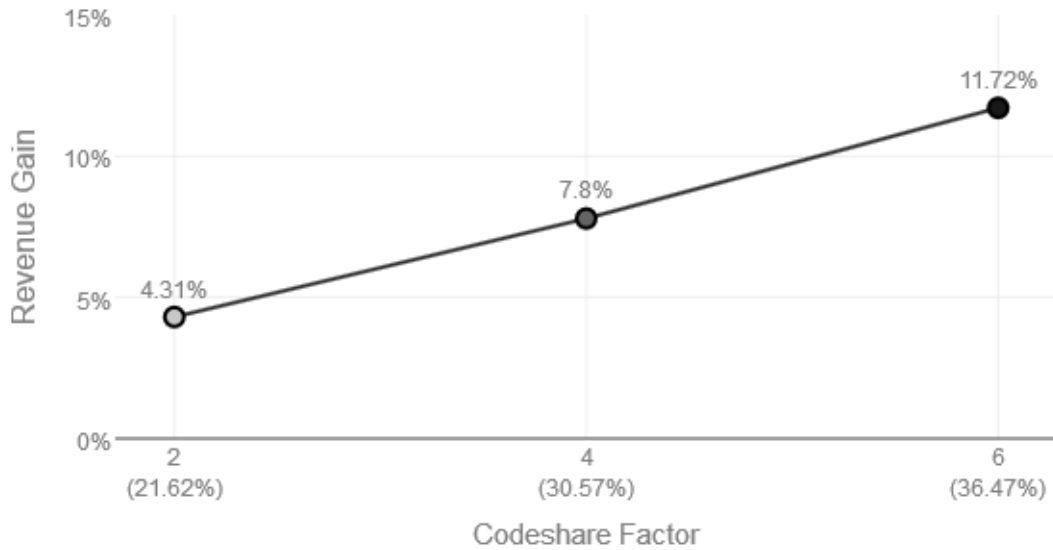


Figure 20: Sight stage, revenue gain trend over operated OD for Airline1

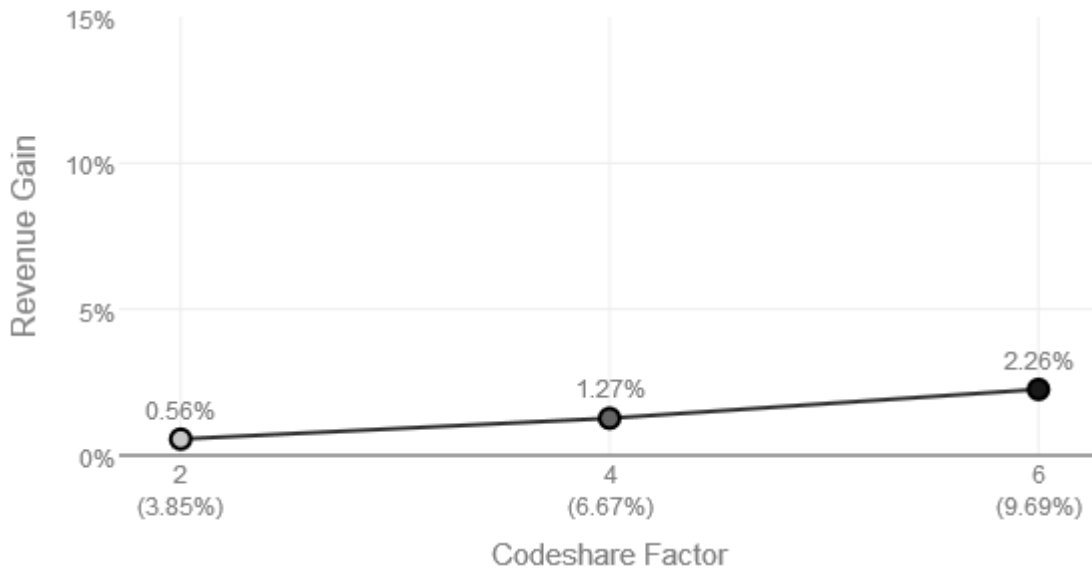


Figure 21: Sight stage, revenue gain trend over operated OD for Airline2

iii. *The Split Stage*

The results along the split stage provide insight on where dynamic proration methods help and where they do not. In the network considered for the study, the

proportion of virtual, parallel and complementary code share demand out of the total demand of both airline networks is as shown in Table 12.

Table 12: Virtual, Parallel, Complementary code share percentages in the partnership network

	Marketing Airline	Operating Airline	Code share %
Virtual code share	Airline1	Airline2	1.5%
	Airline2	Airline1	4%
Parallel code share			0.1%
Complementary code share			0.1%
Total Operated		Airline1	21.7%
		Airline2	72.6%

Virtual code share and parallel code share are itineraries where the marketing airline does not operate any segment on the itinerary. However, the marketing airline benefits from selling such itineraries as it gets a marketing fees based on the proration agreement signed between the partners. The dynamic proration mechanisms based on bid prices used in simulation tend to get biased for virtual and parallel code shares without such marketing fees provisions. Dynamic additive proration tends to be biased towards the marketing airline, as it gives only the bid price to the

operating airline and remaining revenue to the marketing airline. Dynamic multiplicative proration splits the revenue based on the bid price of the operated segment flown by each airline for a code share itinerary. For virtual and parallel code shares, the marketing airline does not receive any revenue.

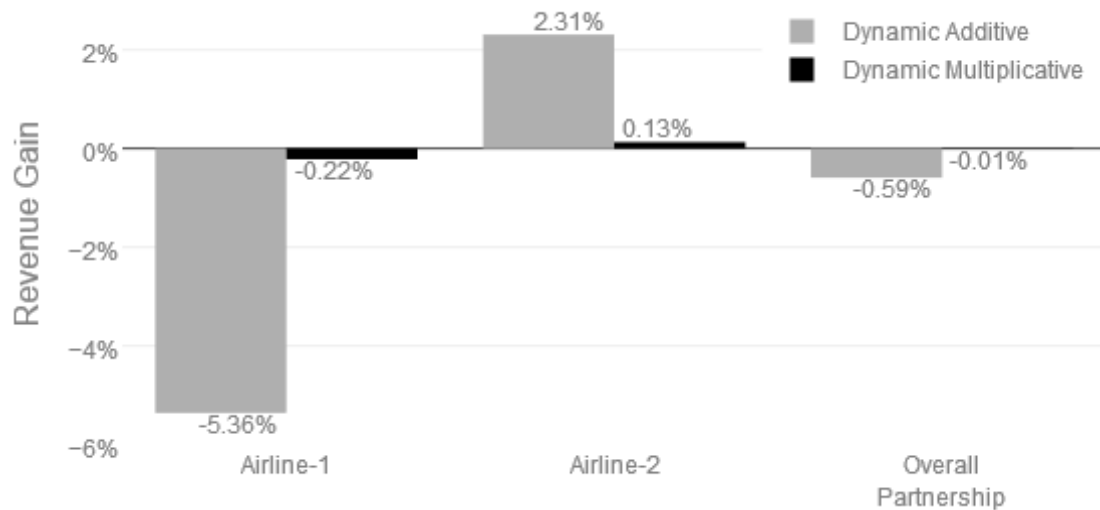


Figure 22: Revenue gain along split stage over static proration

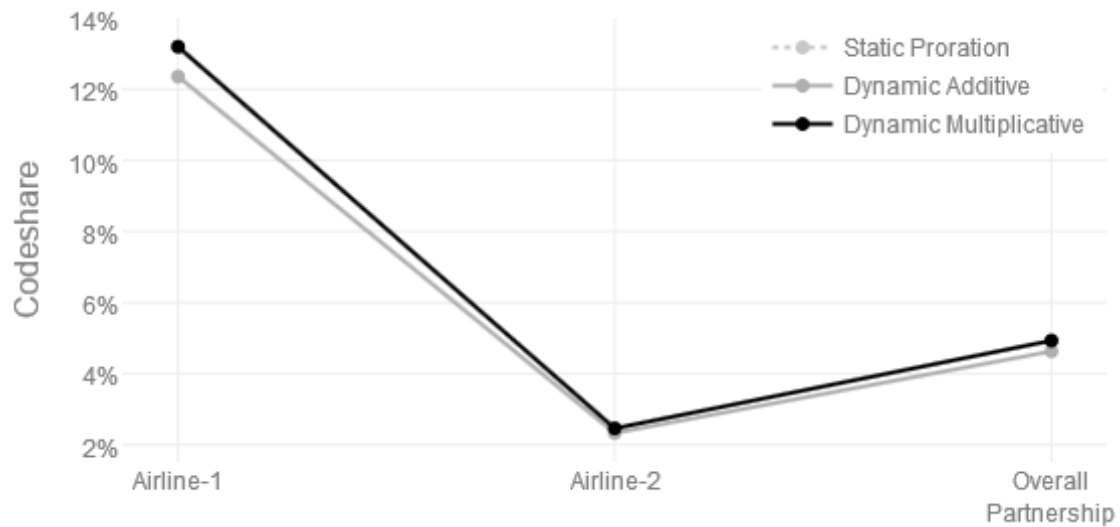


Figure 23: Code share gain along the split stage over static proration

Figure 22 outlines the revenue impact of dynamic proration methods vs static proration method that exists in reality. As observed in Figure 23, Dynamic multiplicative proration has the same percentage of code share traffic as static proration method while Dynamic additive has marginally lesser code share traffic. The observations in Figure 22 and Figure 23 are interesting due to two reasons.

First, the dynamic multiplicative proration redistributes revenue from Airline1 to Airline2 without impacting overall partnership revenue. Figure 24 makes it clear that proration ratio across markets in static agreements were favorable to Airline1 covering more than 50% of the area. Hence Dynamic Multiplicative proration corrects the proration ratios to the fair share of revenue in line with the bid prices of the legs of Airline1. Since the static proration agreements were good to

begin with, this did not lead to any significant revenue gain for the overall partnership.

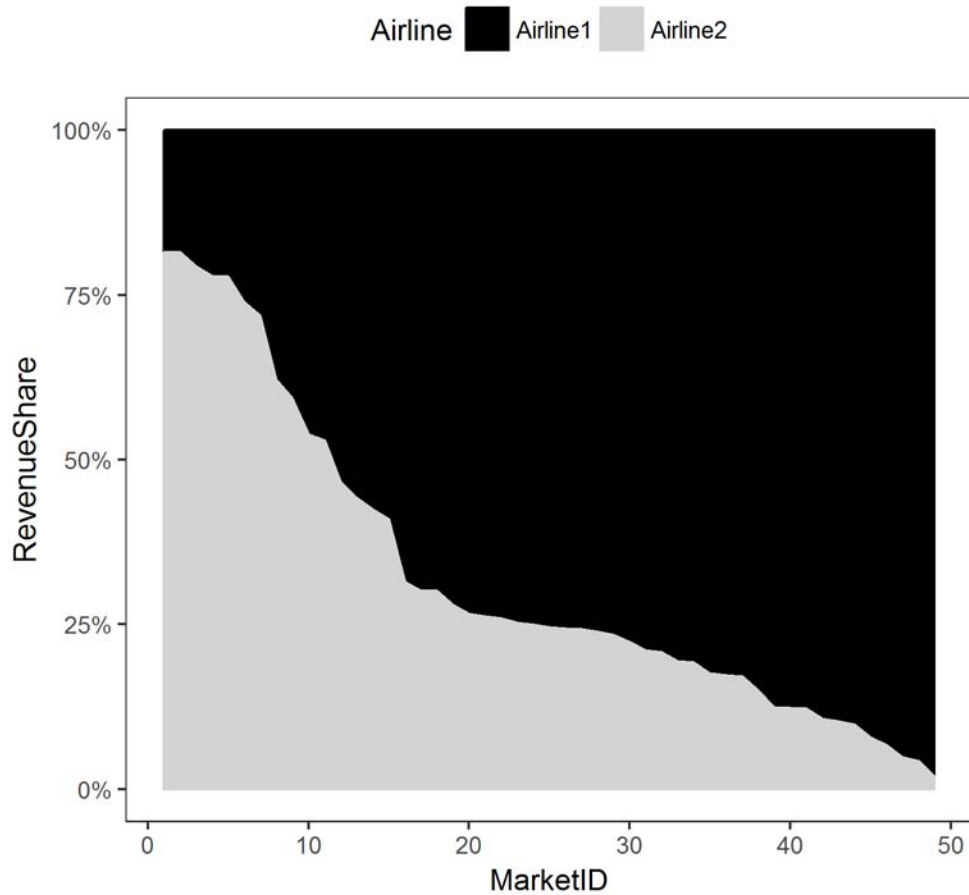


Figure 24: Market share by revenue held by the partners

Second, the dynamic additive proration leads to revenue loss for Airline1 and revenue gain for Airline2 but ends up with a loss for the overall partnership. There are two factors at play here. First, Airline2 has a higher share of virtual code share demand as the marketing airline. Dynamic additive proration provides operating airline only the bid price expected at the time of the sale and whenever the passenger pays a fare higher than bid price, it is favorable to the marketing airline. This causes Airline1 which originally claimed higher share in static proration agreements in comparison to bid prices to lose revenue. Second, True O&D optimization uses previous optimization bid prices as estimate for prorated revenue which leads to a feedback loop in case of Dynamic Additive proration. Lower estimates on code share revenue share for operating airline leads to dilution as well as an expectation that the revenue from code share does not increase with time. This leads to rejection of code share demand leading to drop in code share percentage as well as revenue loss for the overall partnership.

In addition to the above observations, the higher percentage of virtual code share traffic is not realistic and could have been caused by trip breaking logic used for breaking tickets into itineraries. A different

trip breaking logic compounded with a better mechanism for handling virtual code share itineraries in case of dynamic proration could lead to different results. This will be a part of the future work in this area.

b) Consolidated Results

Previous subsection walked through the detailed simulation results along each stage of integration maturity. This subsection first defines the revenue opportunity that exists between two extreme scenarios and consolidates the results from the previous subsection within the opportunity space:

Completely Decentralized systems (Worst Case): Here the revenue management systems are unaware of the partnership and consider code share itineraries demand as operated O&D demand during forecasting and optimization. The availability computation is done using AVS messages exchange and static revenue sharing mechanism is used.

Joint Centralized System (Best Case): This refers to a very tightly integrated “know-all” virtual entity that has complete information about both the airline network and makes the inventory control decisions as a single airline. As previously described such a centralized

system is not quite realistic due to several factors including the option of the airlines to exit an alliance.

In this section, a consolidated overview of the expected revenue gain from each integration mechanism is sketched. The overview is provided for the entire alliance and for each airline as in the previous section. The total opportunity window available is defined by simulating the worst and best case scenarios as described above and taking the difference between the revenue of these scenarios. The revenue opportunity window that exists between these two scenarios is

2.67% of incremental revenue for the overall alliance network.

Results in Figure 25 show that 88%(2.35% incremental revenue) of the total revenue opportunity can be achieved by upgrading to bid price exchange for availability computation and True O&D forecasting and optimization. Bid price exchange for availability calculation covers 66% of the total revenue opportunity (1.77% incremental revenue). True OD forecasting and optimization covers an additional 21% (0.58% incremental revenue) of the revenue opportunity.

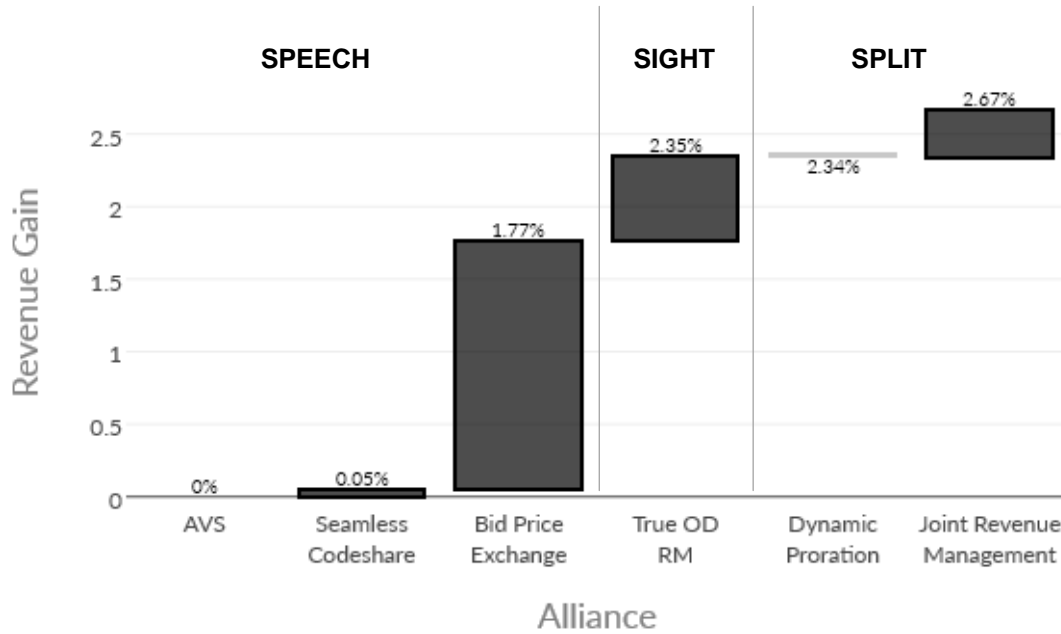


Figure 25: Revenue opportunity achieved for the partnership (>80%)

The overall gain for the partnership is achieved without penalizing any single airline. The individual airlines in the partnership as well tend to gain from these steps in the direction of closer integration and maturity as shown in Figure 26 and Figure 27. Airline1 achieves more than 95% of the total opportunity, while Airline2 achieves more than 80%. This shows that the revenue gain roots from a win-win situation that aligns individual airline revenue goals with the overall partnership goals. This revenue gain can be achieved by partner airlines by upgrading to better information exchange mechanisms and decision making like bid price exchange with true O&D demand forecasting and optimization within the practical realms of decentralized systems.

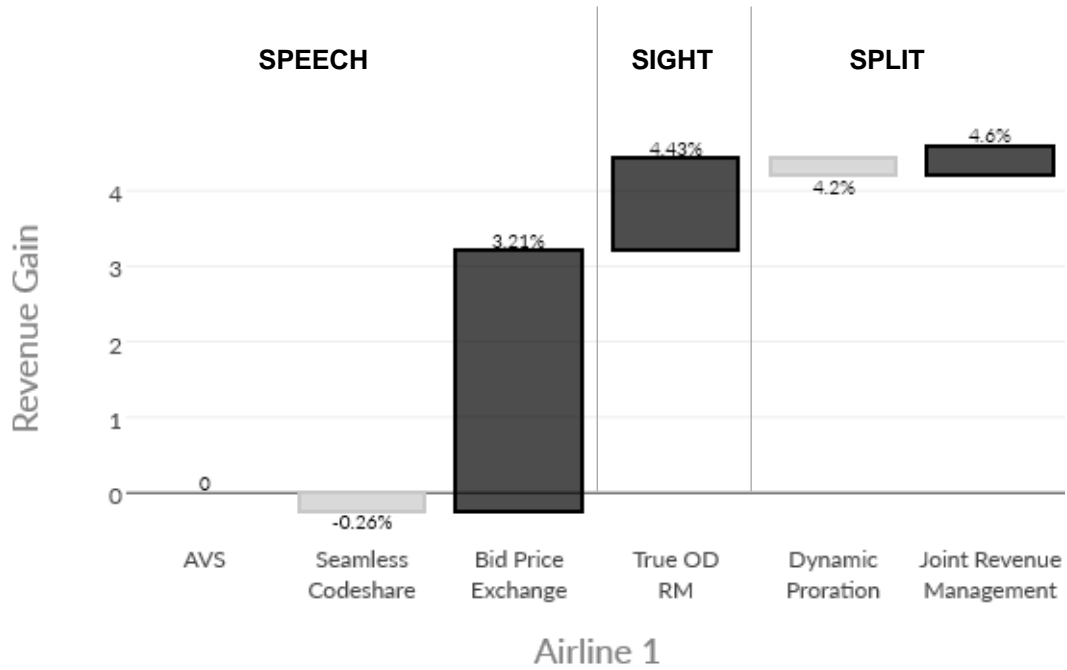


Figure 26: Revenue opportunity achieved for Airline 1 (>95%)

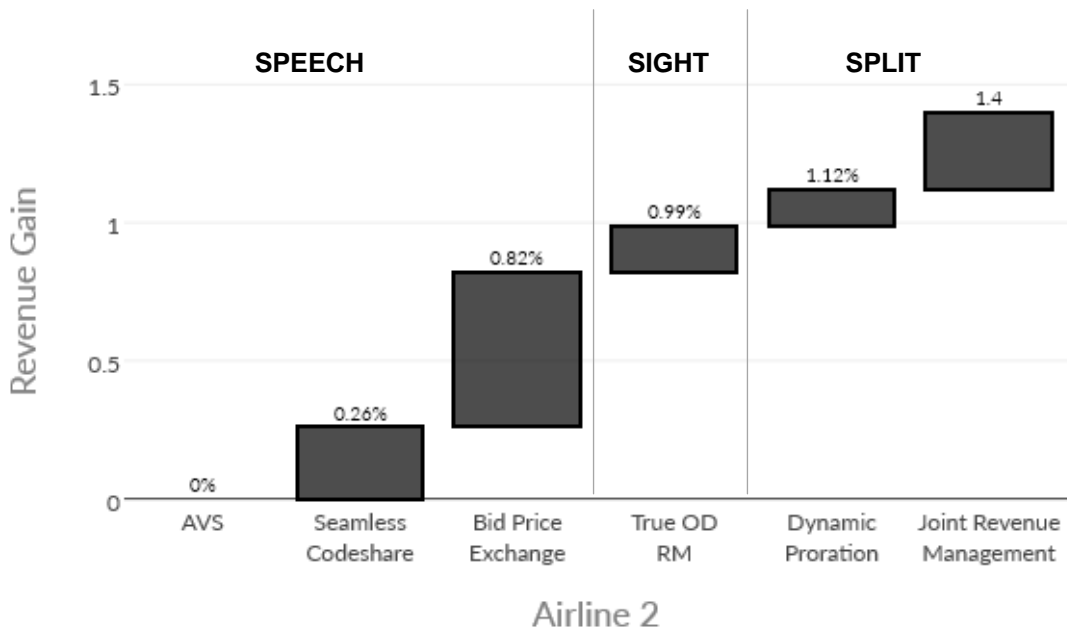


Figure 27: Revenue opportunity achieved for Airline 2 (>80%)

VIII. CONCLUSIONS

At this juncture, a quick recap of the sections on prior work and the motivation for present study is required. Prior work shows that alliance partners would not prefer a very tight integration of operations and information systems due to several legal, sovereignty and nationalistic issues. A joint revenue management system that has all the information required from all alliance partners is preferable but not realistic due to several factors outlined and thus mandates a loosely coupled approach to information exchange in systems

integration. A realistic scenario under the given circumstances is to create an eco-system where the information systems at individual airlines collaborate by communicating with each other and exchange real time information for allowing informed decision making.

The information that can be shared between the airlines is categorized into three groups and incremental stages of maturity of integration are defined - speech, sight and split.

Speech: Availability information exchange between the systems that allows airlines to better market and sell seats on code share itineraries

Sight: Complete itinerary (true origin and destination) information that allows the revenue management systems to better estimate demand and estimate the revenue value of the same

Split: Dynamic revenue sharing mechanisms that enable airlines to make an informed decision about how to split the revenue from code share itineraries

A roundtable discussion with the real practitioners showed that some integration efforts are already being tried out with the major focus on the speech dimension where inventory systems are integrated to share real time information about availability. Next generation revenue management systems that consider true origin and destination demand and revenue proration agreements are hitting the market (Doreswamy & Kulkarni, 2016). Dynamic proration mechanisms require a major level of trust among partners and deeper level of integration. Hence an inherent order is established in the stages of maturity that partner airlines can target to achieve and the simulation studies conducted on real airline alliance network data follow the path of maturity than a factorial design of experiments for the same.

Based on the analysis of the consolidated results, there is a clear two step strategy that can be laid out for airlines in partnership to achieve more than 80% of the total revenue opportunity that exists with a win-win scenario for both airlines in partnership without penalizing individual airlines.

Step 1: Use of bid price exchange for seats availability evaluation

As shown in the consolidated results section, a lion's share of the expected revenue gain comes from upgrading to a bid price exchange based availability evaluation method. Bid price exchange between airlines for evaluating code share itineraries is already in a state where few airlines have adopted it, and the technology is in a mature state to allow this real time exchange (Ratliff & Weatherford, 2012). Combining these two facts, bid price exchange for seats availability evaluation is clearly an area that airline alliances should address as it promises significant gain and technical feasibility has been established.

Step 2: Adopt true origin and destination revenue management system:

True origin and destination revenue management is the second integration strategy that should be evaluated and implemented by the alliances. True OD forecasting and optimization promises an additional 22% capture of the total revenue opportunity.

An additional note on the dynamic revenue sharing mechanism is required. Although the revenue gain in the simulation of dynamic revenue sharing mechanism are not very significant due to a good initial state, they do tend to remove bias in revenue sharing

and ensure that each partner gets a fair share of the revenue earned from the code share itineraries.

IX. FUTURE WORK

Few experiments can be perceived as a fall out of the present study and are in active consideration by the authors can be listed as follows:

a) *Dynamic revenue proration mechanisms for virtual code shares*

As seen in the analysis of the split stage, the results do not represent the true picture due to the share of marketing airline being zero in dynamic multiplicative proration. Designing dynamic proration mechanisms that handle virtual code shares appropriately is an area of future research.

b) *Truthful information sharing between partners*

The simulation studies conducted assume that the information (bid prices) shared by airlines for code share itinerary evaluation and revenue sharing are truthful and accurate. In case of dynamic proration mechanisms, there is incentive for the airlines to not share accurate bid prices and manipulate the system by bumping up the bid prices in order to extract bigger share of code share revenue. Research is being done in the area of mechanism design using game theoretic approaches that incentivize truthful information sharing (Hu, Caldentey, & Vulcano, 2013). Simulation as a tool would be useful in validation and quantification of the impact of designed mechanisms.

c) *Use of partner information in optimization*

Dynamic valuation research (Belobaba & Jain, 2013) suggests that using partner bid prices in optimization can lead to better revenue mix and higher revenues. Simulation studies to estimate the gain from using partner information during optimization is a potential area of future research.

Further the authors will endeavor to continue integrating suggestions from academic work into the APOS framework in order to quantify the revenue impact that can be expected from implementing the suggested strategies.

X. GLOSSARY OF TERMS

1. **ATA:** The *International Air Transport Association* is a trade association of the world's airlines.
2. **WATS:** **World Air Transport Statistics** is a comprehensive and up-to-date reference compendium of aviation statistics covering a wide range of key industry areas
3. **RPK:** **Revenue Passenger Kilometers (RPK)** is a measurement used in the aviation industry. Each kilometer a paying passenger has flown counts as an RPK
4. **GDD:** Global Demand Data

5. **PNR: Passenger name record (PNR)** is a record in the database of a computer reservation system (CRS) that contains the itinerary for a passenger, or a group of passengers travelling together
6. **PODS:** The Passenger Origin-Destination Simulator
7. **AGIFORS:** The Airline Group of the International Federation of Operational Research Societies
8. **CRS:** Computerized Reservation System
9. **GDS:** Global Distribution System

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Ecotourism Potentials, Challenges and Prospects of Maze National Park, South West Ethiopia

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GJMBR-G Classification: *JEL Code: L83, Q00*



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Ecotourism Potentials, Challenges and Prospects of Maze National Park, South West Ethiopia

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I. INTRODUCTION

Tourism is a planned and time bounded traveling in person or team to places outside one's own village for visit, leisure, business and other purposes. Previously tourism was considered as a visit trip to natural and/or man made areas of high aesthetic value. Humans have used to travel since ancient time leading nomadic life, visiting, trade, communication, encroaching, settlement and other purposes. Nowadays, humans travel to most corners of the planet and even beyond the planet, known as space tourism (Yogi, 2010).

Tourism has become an important trade and prosperity sector. The main benefits of tourism are income creation and generation of jobs. Tourism contributes to 5% of the world's GDP and account for 6% of world's exports being the fourth largest export

sector next to fuels, chemicals and automotive products (Rajani and Vasanthakumari, 2015). The World Travel and Tourism Council (WTTC) estimated that Travel and Tourism generated US\$7.6 trillion (10% of global GDP) and 277 million jobs (1 in 11 jobs) for the global economy in 2014 (WTTC, 2015). Parallel report by WTTC indicates the international tourist arrivals also surged, reaching nearly 1.14 billion and visitor spending more than matched that growth. Visitors from emerging economies now represent a 46% share of these international arrivals (up from 38% in 2000), proving the growth and increased opportunities for travel from those in these new markets.

Tourism alone has become the biggest industry in the world in terms of economic value, including gross output, value added, capital investment, employment, and tax contribution; and responsible for over 230 million jobs and 10 percent of the gross domestic product (Theobald, 2005). Tourism generates positive economic growth to both host countries and tourists' home countries. For this reason, tourism has been seriously considered in the national sustainable development strategies of many developing countries to generate huge economy from their less threatened natural resources.

The rapid growth of tourism in complementation of economic development during the last few decades has also led to an increasing concern of its impacts. The economic benefits of the tourism industry has caused mass tourism which have caused considerable impacts on local communities with respect to culture eroding, conflicts, economic disruption, trades of exotic pets and drug, commercial sex, disturbance of wildlife and the natural environments of the host destinations (Yogi, 2010). The development models that societies have adopted throughout the twentieth century were characterized by encouraging industrialization and promoting economic growth, rather than the maintenance of ecosystem goods and services (Fonesca, 2012).

Thus, to develop the tourism sector and enhance its potentials, it needs pre-concern of the attributes of society, nature and environment. Unlike the conventional tourism to natural areas and to the people who live in and around them, scholars have developed ecotourism, a niche within the tourism industry, which is

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responsible travel to natural areas [in a way] that conserves the environment and improves the well-being of the local people (Biqi, 2012). Ecotourism primarily means marketing the serene natural habitats as tourism 'product' with an inherent element of nature education (Rajani and Vasanthakumari, 2015).

Ethiopia endows wide range of natural, biological, cultural and artifact diversities which suit to the tourism industry. Throughout the last decade, the country is eagerly promoting ecotourism for tourists from homeland and abroad. However, the implementation of national strategies and regulatory frameworks of ecotourism in developing countries is challenging. Developing countries are highly dependent on natural resources in the surrounding environment and in protected areas such as National Parks. Hence, developing sustainable ecotourism needs approaches. Sustainable ecotourism or conservation of biodiversity in National Parks is done through two main approaches: one approach is the preservation approach, in which National Parks are set aside to exclude human activities except for tourism. The other approach is community-based conservation approach that allows local people around National Parks to benefit socially or economically from parks. The former was dominant approach until the 1980s, but it has now been substituted by community-based conservation (Muhumuza and Balkwill, 2013) to ensure sustainable ecotourism through local communities' participation, ecotourism development and equitable sharing of benefits.

As stated above, tourism is a big development sector; and ecotourism is the marketing of nature in a way that environmental processes, the ecosystem services and goods, are conserved. Sustainable ecotourism is a result of infrastructure development, equitable sharing of benefit and creating alternative livelihoods to local communities around tourism destinations. In Ethiopia, sustainable ecotourism is doubtful or poorly managed as more than 80% of the population is nature dependent, agrarian community who manipulate nature on the basis of their interest rather than the approaches to sustainable ecotourism.

This paper aims to identify the ecotourism potentials, challenges and prospects of ecotourism in Maze National Park to provide an input for policy makers and implementers for the development of a modern and sustainable nature-based tourism industry in Ethiopia.

II. RESEARCH METHODOLOGY

a) Description of Study Area

Maze National Park (MNP) was established in 2005 and found at 6025'N37014'E (Andabo and Gamo, 2015). MNP is located at the lowland altitude in the boundaries of Quca, Zala, Daramalo and Kamba Weredas. The park exhibits long semi arid climate. The

park is found at 473 kms from Addis Ababa, capital city of Ethiopia and Africa, and at 83 kms from Wolaita Soddo in the main road which crosses the park in way to Gofa Sawla. Therefore, MNP is easily accessible for tourists from abroad and inland who want to visit the natural beauty of the park.

b) Methods

The study used survey design (Kelley *et al.*, 2003) to assess the potentials, challenges and prospects of Maze National Park for community-based sustainable ecotourism. For this purpose mixed research approach was employed including participant's observation including field survey using binocular and camera, interview and focus group discussion. The study primarily used two categories of in-depth interview questions, one for MNP staffs and the other for local communities. Exploratory household interview was carried out to explore livelihood experiences of participants (Zaiton *et al.*, 2013) and the rest of local communities.

The study exhaustively used a set of data from primary and secondary sources. Primary data sources were obtained from local community, MNP management and staffs, Male semi-pastoralists, GO and NGO and participant's observation of local livelihood and field survey. Secondary sources were reviewed from books, documents from Maze National Park, published and unpublished materials and Web. There are seventeen kebeles adjacent to Maze National Park. Five kebeles from three Weredas were purposively selected as cases for this study, 2 from Quca Wereda (Masha Caba and Masha Morka), 1 from Daramalo Wereda (Domi'a-Umala) and 2 from Zala Wereda (Mella Gayile and Wagesho). These kebeles were reported to have high interaction with the park by the MNP management. The sample size for this study was determined using (Yemane, 1967) at 95% confidence interval.

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size and e is the level of precision. In a week field survey in the selected kebeles, it was remarked that at least 80 households visit the park on daily bases. When this formula is applied, we get a sample size of 67 households. Then, 13 households from each kebeles except Masha Caba (from which 15 households) were randomly selected for interview.

Key informant focus group discussions in each of the five kebeles were held with five individuals who were selected from the interviewees because they had better knowledge of the park and its surroundings. Besides the local communities, 20 MNP staff members were interviewed and of these five key informants were selected for focus group discussion. Eight focus group discussions were made, 5 with local communities, one

with MNP staffs, one with 3 experts (Quca Wereda Rural and agriculture development office head, Quca wereda natural resource protection expert and head of NGO in Morka) and one with Male Semi-pastoralists coming to Maze National Park were purposively selected. Accordingly, 87 respondents and 38 individuals participated in the interview session and focus group discussions, respectively.

III. RESULTS AND DISCUSSIONS

The analysis of interview and focus group discussion revealed Maze National Park, formerly called Shambara (Andabo and Gamo, 2015) by local communities endowed large populations of medium to large size mammals including elephant (*Loxodonta africana*), giraffe (*Giraffa camelopardalis*), tiger

(*Panthera tigris*) and buffalo (*Syncerus caffer*) in the last century. The park is significant for its biotic and physical resources. However, resource accumulation within the park, unmet expectations, biotic pressures, lack of infrastructure and stochastic perturbations in the landscape are the prominent bottlenecks for sustainability of the park.

a) Ecotourism

Ecotourism is an environmentally conscious travel that enhances a traveler’s appreciation of nature’s beauty and biodiversity, while reducing the carbon footprint (Biki, 2012). Due to the recent establishment of the park and lack of infrastructure, tourism statistics of Maze National Park is low. But, the scenic landscape of the park is calling upon many tourist arrivals.

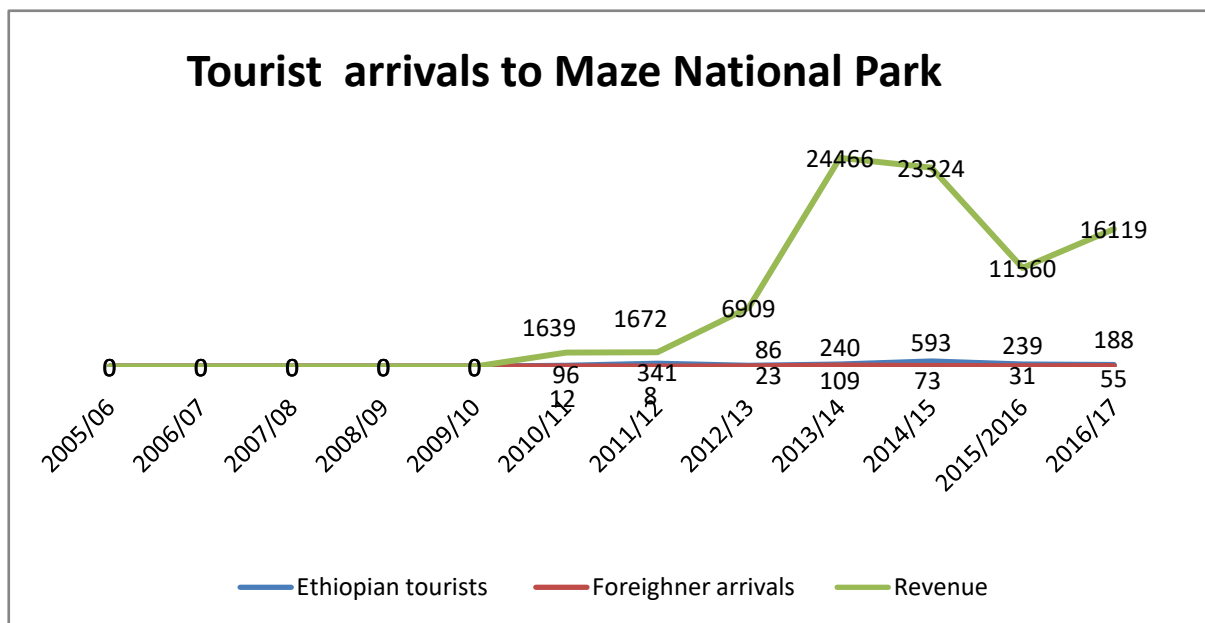


Figure 1: Tourist flow to Maze National Park from time of establishment to present (Source: MNP HQ).

Ecotourism has been marketed as a form of nature-based tourism (Dabour, 2003). According to MNP Head Quarter office, most tourist arrivals to Maze National Park are from Spain, Italy, German, Netherland, Scotland and Poland. Inland tourist flow is better relative to foreign arrivals, but remains poor except for University students visiting the park for educational purpose mainly from Wolaita Soddo and Arba Minch Universities. Due to low flow of tourists, the park revenue, in Ethiopian birr, is below the expected. Figure 1 indicates that MNP was not visited through the first five years after its establishment. Tourist arrival shown slight progress and reached its peak in 2013/14. Then, the flow retarded during 2015/16 and starts to rise in 2016/17. Apart from factors contributing to inconsistency in tourist flow, less work on promotion of the park by concerned bodies, lack of infrastructure, difficulty to encounter some wild animals, due to migration and disturbance in the park

for different purposes were the major factors contributed to low statistics of tourist arrivals into MNP.

b) Ecotourism Potentials of Maze National Park

The study proved that Maze National Park has untouched and diversified ecotourism potentials. Interview and focus group discussion has revealed the following analysis.

Table 1: Ecotourism opportunities in Maze National Park: Interview Analysis

Interview Variables	Percentage Share	
	Local Community (N =67)	MNP Staff (N = 20)
Wildlife	71.6	100
Rivers	35.8	70
Wonja Stone Cave	27	100
Bilbo Hot Spring	44.8	100
Savanna Grass	65.7	50
Inspiring landscape	50.7	60
Riverine forests	11.9	40
Location	7	35
Religious trees	25.4	100

As indicated above (Table 1) wildlife, rivers, Wonja stone cave, Bilbo hot spring, savanna grass and the scenic landscape of MNP are among the major ecotourism attractions. The investigator has also observed that medium to large mammals, birds,

amphibians, reptiles, rodents, vegetation and the gifted landscape are the basic components of ecotourism in the park’s catchment. While visiting the south tip of the park, the Bilbo natural hot spring was amazing beauty of MNP.



Figure 2: Bilbo Hot Spring (Source: Field survey photo).

The spring hot water gushes out in the form of boiling water; and part of it evaporates in the form of steam. During the field observation at Bilbo hot spring, I had a video supported interview with local elder in Hanika-Phasa Kebele of Kamba Wereda. Local people call the Bilbo hot spring as *Bilbo Tsabala* (the Bilbo healing hot spring) and believe that the Bilbo hot spring is God’s work. The community elder has pointed out that the Bilbo hot spring is their *Abuwa* (Ark) to which local communities and outsiders come to get healed from their physical and spiritual illnesses and to be free from any curse. Among others, visitors of Bilbo hot spring come from Zala, Dingamo, Garsa Anko, Hanika, Shella and Maze. They swear any oath in the name of the Bilbo hot spring. The local community has strong traditional belief that the spring is the cause for their blessings and curses. The elder informed that people

sacrifice to the Bilbo hot spring to get something they wish/pray from spiritual point of view. Unlike other resources of the park, local communities have good attitude towards Bilbo hot spring due to its physical and spiritual values. This is an indication to the fact that equitable sharing of benefits or creation of alternative means of benefiting local communities will enhance community-based ecotourism in MNP.

c) *Challenges of Ecotourism and Sustainable Tourism in Maze National Park*

Major challenges posed on Maze National Park come from outside and are enumerated under. Land-use changes that have occurred in Maze National Park have caused shrinkage in both the park area and land-cover (Andabo, 2012). The importance and scope of ecotourism is expanding as its sustainability

dimension works on safeguarding the biodiversity, social structure, culture and economic wings. In this respect, Rajani and Vasanthakumari agree that delivering viable tourism, ensuring responsible, real and effective ecotourism is a great deal. Recognizing the different approaches of ecotourism to the conservation and management of ecological and cultural resources is a great challenge to sustainable ecotourism (Rajani and Vasanthakumari, 2015).

i. *Population Pressure*

High human population pressure due to low practice of family planning and low household income in developing countries has caused overexploitation of natural resources. Maze National Park is an ideal place

(lowland rangeland) for pastoralists/cattle grazing. As a result, local communities around the park have a fast growing livestock population. Population pressure is the most challenging factor for the existence of Maze National Park. According to the Ethiopian Central Statistical Authority (CSA) 1994 projection, annual human population around MNP increases at 2.26% rate (CSA, 2001). All local communities around the park live for subsistence such that they are highly interactive with MNP to fulfill their livelihood needs. Annual livestock population growth in Ethiopia is increasing (Table 2); and the country's livestock population is the largest in Africa and the tenth largest in the world (Conservation Strategy of Ethiopia, 1996).

Table 2: Livestock population statistics in Ethiopia (2005-2010).

% Annual changes	2005	2006	2007	2008	2009	2010
Cattle	1.7	4.2	6.8	10.3	3.6	3.2
Sheep	9.0	14.7	14.0	10.5	-4.2	3.8
Goat	7.4	10.1	13.4	17.0	0.8	0.3
Camel	-2.7	-4.6	40.9	63.7	-24.7	6.3
Poultry	-36.6	42.5	6.1	15.7	-3.6	10.3
Horse	4.9	3.4	5.5	7.3	0.6	11.6
Donkey	4.3	9.1	4.9	23.9	-2.7	5.4
Mule	-1.1	7.2	-4.4	15.7	-0.8	-2.1
Beehives	-11.6	21.5	-1.7	-4.2	0.0	na

(Source: Metaferia et al., 2011)

Besides, over exploitation of the park's resources by local livestock population, Male semi-pastoralist livestock has remained the top urgent issue without solution. Metaferia et al. 2011 state that Ethiopia shares significant livestock in lowland and pastoral areas. Livestock data from 2006 to 2010 in five kebeles surrounding MNP in Quca wereda (Table 3) indicate livestock population is rising (except for years of drought

and livestock diseases) and significantly disrupting the park's ecosystem. So, the park management is advised to be skilled and empowered through trainings and workshops on improving livestock production; and monitoring and evaluation of the performance of livestock in outdoor keeping, without encroaching into the park ecosystem.

Table 3: Livestock population statistics in kebeles of Quca around Maze National Park (2006-2010). (Source: Quca Wereda Rural Development and Agricultural Extension Office).

Kebeles	Cattle	Sheep	Goat	Horse	Donkey	Mule	Year
Daho	5699	99	2060	0	27	6	2006
	4113	71	1487	0	20	7	2007
	6057	105	2191	2	33	12	2008
	7874	137	2848	3	43	16	2009
	11660	233	1998	0	14	55	2010
Masha Morka	3096	3	950	0	4	1	2006
	2075	4	636	0	4	0	2007
	3395	9	1008	0	9	2	2008
	3293	12	1310	0	12	2	2009
	2055	13	946	0	7	0	2010

Koddo Wonno	1422	22	937	0	9	2	2006
	1026	18	676	0	7	1	2007
	5017	26	996	0	13	2	2008
	6522	34	1295	0	17	3	2009
	1559	26	210	0	3	1	2010
Masha Caba	4667	360	1761	2	8	0	2006
	3368	259	1271	1	6	0	2007
	4960	381	1872	2	11	1	2008
	6448	495	2434	3	14	1	2009
	3098	363	1550	2	9	1	2010
Koddo Lade	4675	67	1233	1	7	1	2006
	3374	50	843	1	6	0	2007
	4969	74	1242	2	11	1	2008
	6460	96	1615	3	14	1	2009
	3091	52	1028	0	8	0	2010

ii. *Wildlife Death and Migration*

The park has encountered wild animals' death since 2008. The different causes of wild animals' death in MNP are indicated in Table 4.

Table 4: Record of wild animals death in Maze National Park (Source: MNP HQ).

Wildlife deaths for different reasons in Maze National Park.					
Years	Hunting	Vehicle	Conflict	Fire	Unknown
2008/09	48	20	-	-	-
2009/10	37	6	-	3	6
2010/11	10	10	10	1	-
2011/12	4	11	7	-	5
2012/13	4	4	1	-	3
2013/14	2	4	7	7	4
2014/15	1	50	2	-	-
2015/2016	4	41	-	-	5
2016/17	-	4	-	-	5
Total	110	150	27	11	28

During the last nine years, 326 wild animals were died for known and unknown reasons in MNP. Most of wildlife deaths in the park were due to vehicle (46.01%) and hunting (33.74%). The main road passing the park has 10m to 12 meters diameter which can accommodate two vehicles at a time. Due to high production of cereal and cash crops, many vehicles pass through the park. The main reasons for death of wild animals by vehicle include 1) drivers do not respect animal rights 2) substance use while driving 3) most of the business vehicles crossing MNP travel during the night times and 4) drivers do not follow traffic rules in National Park regions (drive beyond the speed limit in the park region). The local communities have good awareness about animal rights and their ecotourism role and are appreciated for their respect to wild animals and not hunting them. However, hunting of wild animals of the park is done by Male community coming from South

Ari Zone, South Omo. These people are semi-pastoralists who move place to place in search for water and pasture for their domestic animals. Due to the interruptions by local people and Male people, wild animals of MNP migrate to other places and exposed to health problems and deaths for unknown reason. Perhaps, causes of such deaths might be contact with domestic animals while grazing and Tse tse fly, tick, bug and other veterinary disease vectors. Local communities around MNP send their cattle into the park. Sometimes predators such as Lions kill and feed on their cattle. On return, the local communities revenge the lions by killing them using traps (Figure 3).



Figure 3: Skin of Lions killed in traps by local communities in revenge for their cattle killed by Lions (Source: MNP HQ).

iii. *Conflict of Interest*

Investment in service-oriented projects, particularly tourism, in developing countries is often regarded as a high-risk task (Dabour, 2003). Ecotourism is both process and activity. Formerly, the local communities use resources of MNP for various livelihood purposes such as fuel wood, honey collection, timber products, livestock grazing and drinking and grass collection. After the establishment of the park, conflict of interest has come about as the local communities have been prohibited all the resources from that catchment without any alternative substitute for those resources. Inadequate participation of the local people in ecotourism development process and inequitable benefit sharing resulted in negative attitudes of the local people towards ecotourism.

iv. *Poor Political Commitment*

Poor political commitment may result from low understanding and commitment to implement government policies, poor skill and knowledge, low

awareness, giving low weight to environmental issues and poor institutional integrity of the nominated politicians. Maze National Park has the smallest area coverage (less than 202 km²) compared to the rest of national parks in Ethiopia and is continuing to diminish due to alarmingly growing human and livestock populations followed by poor political commitment of the local governments. Of course, there are disturbances at all corridors of MNP; for instance, the Quca Wereda government gave 3.6 ha of Maze National Park land at Domba for Morka youths for farming as means for stabilizing the political opposition led by youth during the 3rd election in 2005. Simple provision of incentives as a means to calm community anxiety to exploit resources marginalizes a certain part of a community and intensifies over exploitation of resources, drains confidence on ownership, and increases annoyance by marginalized community towards further development of ecotourism (Ketema, 2015).



Figure 4: Morka kebele youths farmland at Domba within the Park. (Source: Field survey Photo)

The researcher fortunately had prior information that the Male community members have been repeatedly crossing Kamba wereda to reach to MNP since the establishment of the park until the present time for grazing of their livestock. Kamba wereda government knows that the Male's are coming from South Omo Zone and cross their land to reach Maze National Park. But, due to poor/no political commitment by Kamba wereda government, the Male's started illegal settlements and poaching within MNP at Phasa kebele, Kamba. Due to the alarming report by MNP management to Gamo Gofa Zone administration about the Male's huge herd of cattle population (more than 20,000 heads) in MNP, Kamba wereda government was

called to check the real situation by Gamo Gofa zone government. This allowed having good focus group discussion with Kamba Wereda delegates, the Male semi-pastoralists and the Phasa kebele community. The researcher has observed that the situation now in MNP is really harsh, and federal and regional governments must involve in the park's management before the overgrazing by such an increasing Male livestock population perishes MNP in a period of few months through overexploitation and settlements. The Male semi-pastoralist community holds guns and are archers which will also lead to unwanted disputes up on competition for resources and territorial expansion by Male's in MNP.



Figure 5: Overgrazing and illegal settlements by Male community members within MNP at Phasa (Source: Field survey photo).

v. *Climate Change*

The park has been experiencing recurrent drought and low rainfall which are causes for the disease emergence and declining of the biota of the park. Climate change now has become the top urgent issue of the global community. Currently, climate change is devastating Maze National Park than ever before. In Ethiopia, global warming has been killing many livestock and exposed many households to hunger. Focus group discussion with the Male's has shown that the prolonged climate change in 2015/16 (El Niño) has continued to increase in Male area even to present. It has deteriorated all land cover and has caused water source to dry [leaving dusty bare land] in the rangelands of Male wereda. As a result, Male semi-pastoralists have been forced to travel more than 60 kms to reach MNP and to feed and drink their cattle. The Ethiopian government is trying to mitigate the climate change by designing different environmental protection strategies and interventions. However, the severity of climate change in Male wereda has led the Ethiopian government to legally allow the Male semi-pastoralists into MNP to get relief of their cattle.

In the analysis of challenges for sustainable ecotourism in MNP, the researcher has developed triangular tuberous root tree model of challenges emanating from poor livelihoods - poor political commitment - poor infrastructure development.

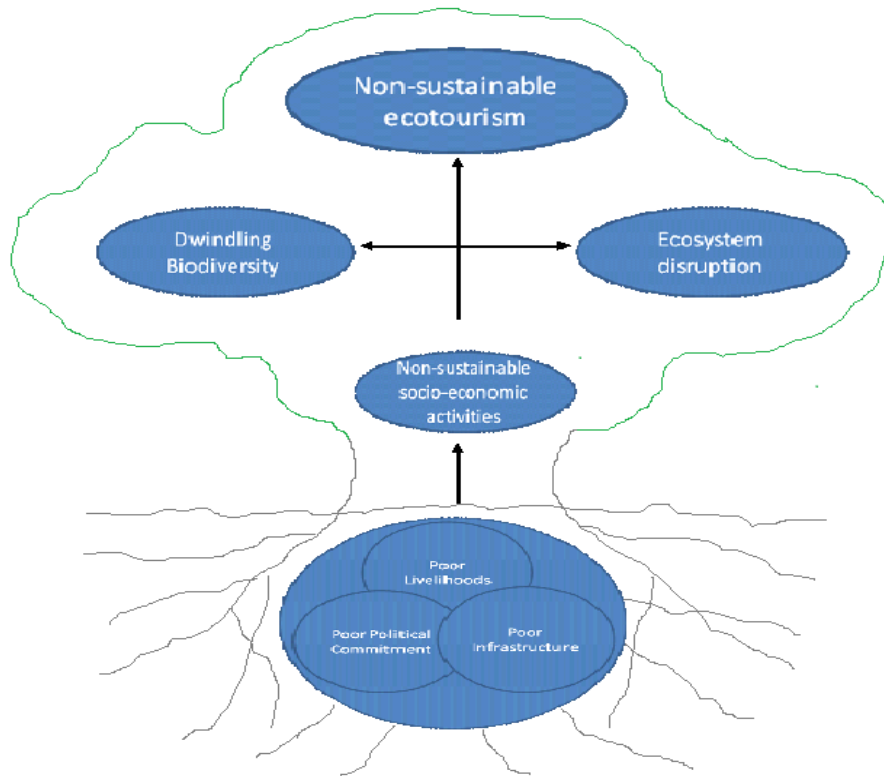


Figure 6: Triangular tuberous root model showing challenges of sustainable ecotourism in Maze National Park

(Source: Wegene Getachew Andabo, the researcher, March 2017).

d) Prospects of Maze National Park: Issues of Focus

The establishment of Maze National Park in Maze area is important both ecologically and economically. Maze National Park was a communal land for long past before its establishment. The establishment of MNP restricted the local communities' open access to the resources of the park. As to the local communities, following the park's establishment, the surrounding communities are suffering from lack of the usual visit to the park area for their domestic purposes. The participant's observation into the perceptions of local communities towards the establishment of the park indicates that most of the local communities are unhappy as they have either not benefitted from it or sustained their open access into the park. Interview and focus group discussion reveal that the park has immense ecotourism potentials to exploit over. If given

more attention, ecotourism in Maze National Park will by far overweight the ecologic and economic values of the other parks in the country as the park is almost intact in all of its resources. The participant puts forward the following prospects as focal areas for the development of sustainable ecotourism in Maze National Park.

i. Organizing Staff Profile

The current staff profile of Maze National Park is observed to be less organized. Recruiting new professionals from Veterinarian, Agronomist, Ethnobiologist, Botanist, Zoologist, Anthropologist, Sociologist, Tourism and Hotel Management and Entrepreneur will empower the park management system. Currently, MNP has 30 male and 3 female, a total of 33 employees. The present staff profile (see Table 5) of MNP is poorly organized as 91% of the staffs are supportive staffs primarily being the protective staffs.

Table 5: Maze National Park Staff profile and their job description. (Source MNP HQ, March 2017)

Staff Profile	Number of individuals	Job description
Park Warden	1	Manager of Maze National Park Management
Wildlife Professional	2	Follow up wildlife condition and every ongoing changes in the park
Human Resource coordinator	1	Organize the staff profile and follow up and support all staffs to be guided by rules and regulations of the park administration
Accountant	2	Leads finance and provides financial information to management, recommends financial actions by analyzing accounting data, prepares reports

Casher	1	Responsible for taking money in the form of cash, check, or credit card, Scans items, provides change, draws balances
Daily cash collector and Promotor	1	Accountable for the credit and collections process
Secretary	1	Supports the executive team
Scout Head	1	Arrange time table for scouts to patrol of the park, coordinates scouts
Scouts	16	Protective staffs, check and protect illegal activities in and around the park area, assist in field work
Driver	1	Accomplishes any duty given by the park warden
Janitor	1	Cleans the park offices and the compound
Guard	4	Watch and protect other staffs and park compound

ii. *Community Participation and Benefit Sharing*

Community participation will increase transparency and create trust between park management and the local community. While participating in the management of MNP, the local communities will form sense of ownership to stop any illegal intrusion into MNP and will be part of the park’s protective staffs. Through community participation local communities start to use natural resources in environments other than the core parkland and will keep their livestock in the fields outside the park. Ecotourism sustainability is full of ups and downs as human-nature interaction persists in poor economies of developing countries like Ethiopia. Thus, MNP office, regional and

federal tourism bureaus need to work on community-based ecotourism assuring equal community participation (men and women); and equitable sharing of the resources and benefits from tourism in the park.

iii. *Adequate Budget Allocation*

Focus group discussions with MNP staffs indicated that the park is not supported by adequate budget to accomplish management activities effectively. For instance, construction of roads inside the park needs machines and huge budget. To this end, the regional government and the federal government are expected to equip MNP to develop sustainable ecotourism.



Figure 7: Focus group discussion with Maze National Park staffs.

iv. *Improved Livestock Production*

A passenger may see many heads of cattle while crossing MNP. Livestock is half livelihood activity for local communities around MNP. Local communities around the park see livestock as social bank. The problem with local breeds is they are many in number but less productive. According to FGDs with local communities and MNP staffs, to minimize livestock pressure on MNP it demands substitution of local breeds with high yield or cross-breed improved livestock species.

household) will prevent livestock and human entry to MNP and minimize disturbance in the park. The water points built for livestock drinking purpose must contain water on regular basis and they must have outlets for cleansing and pouring fresh water into the pool. Therefore, giving priority to the most severely suffering villages around the park, water points have to be built to safe guard the park and reduce conflict of interest.

v. *Building Water Points*

The construction of water points or water lines for livestock drinking and domestic consumption (e.g., communal pools or drilling groundwater at every

vi. *Protection of the Bilbo Hot Spring*

For a visitor, the Bilbo hot spring tells message saying “save me” because it is on communal land that is of many anthropogenic disturbances such as illegal settlements and grazing. During field survey, the researcher observed that there is no protection to the hot spring. Local communities were observed while

taking shower on the flowing water from the hot spring. The spring is observed to be open for local communities and animals. Thus, it is exposed to threats which will challenge its existence in the near future.

vii. *Road Construction*

The national road which crosses MNP is an old gravel road which is not comfortable and preferred even by a passenger. One parameter to attract tourists is suitable road for them and the vehicles they come in. Therefore, considering the immense potentials of MNP the federal government has to have a desire to construct standard asphalt road/highway from Wolaita Soddo to Gofa Sawla and Omo and Mago National Parks. The construction of high way will allow tourists visit not only MNP but also Omo and Mago National Parks in their way. The park has no gravel road except simple roads made by clearing of the land cover by the park management. Due to insufficient pathways and parking facilities in Maze National Park, tourists are unable to see all corridors of the park. In this regard, the building of gravel road, pathways and parking sites is crucial to visit all parts of the park in all seasons.

viii. *Campsites in the Park*

Selection of adequate number and location of camp sites suitable for recreation, entertainment and view in the park is an important task to be accomplished ahead of tourist arrivals. These sites are places where tourists take rest, plant their tents, pass overnight, enjoy themselves watching at the scenic nature, and discuss different issues.

ix. *Harvesting Timber and Non-Timber Products*

The local communities were observed to be highly consuming timber products of the park. MNP has tall forest trees with timber values at riversides. The shrubs and tall trees will be used for local and industrial purposes. However, at the current traditional living

status of the local communities coupled with poor development status of the park, harvesting timber products is risky for the sustainability of the park and its resources. Allowing local communities to harvest timber products in one hand and overexploitation of mature forest trees (whose replacement will take at least fifty-hundred years) only for domestic and income generation purposes in the other hand will open gate for more disturbances in the park. This will result in ecosystem disruption and biodiversity loss. Therefore, the investigator encourages the MNP management and local communities to harvest more on non-timber products of the park. Non-timber forest products include grass, forest honey/apiculture, edible fruits and nutraceuticals, strap and so on. For instance, field observation and previous work (Andabo and Gamo, 2015) indicate that nearly 50% of Maze National Park is covered by grassland, mainly savanna grassland of 3m to 6m tall. Harvesting the grass economy will allow the growth of palatable grass for livestock and wildlife, prevent emergence of vector-born zoonotic diseases, removes breeding sites for vectors of medical and veterinary importance and will increase the biological diversity and productivity of MNP by increasing the survival and fecundity rate of species. However, it is usual to see illegal entries into the core of the park for grass collection. If carefully harvested, this grass will generate high incentive to the local communities, the park and pave the way to alternative income generating activities. In this connection, organizing local community into farmer cooperatives will not only enhance production but also improve management of the park. Doing so, the farmer cooperatives will benefit from the park by marketing products for thatching, local construction, investors (e.g., lodges), hay, livestock feed and other purposes.



Figure 8: Illegal grass harvesting in Maze National Park. (Photo during field survey).

x. *Irrigated Agriculture*

Maze National Park possesses a number of rivers (e.g., Lemase, Domba and Maze) that can be used for irrigation. The vast plains in the park surroundings are good places for vegetables, cereals, horticulture, fruits, root and tuber crops.

xi. *Aquaculture*

The park has large rivers crossing it. The rivers have endowed fish and crocodile species among others. Maze National Park, therefore, is ideal place for fish production and crocodile ranches.

xii. *Film Industry*

The scenic and green nature of Maze National Park particularly during winter (rainy season) coupled with the very interesting native cultures of communities around the park is an adventure for artists to held their theatre, drama and films.

xiii. *Lodges and Green Parks*

Many countries lack sufficient infrastructures such as hotels, lodges, transportation, communication, safety and security and tourism information services all of which aid in the development of sustainable tourism sector (Dabour, 2003). Establishment of lodges and green parks in selected sites around the park will enhance ecotourism, tourism revenue and employment through infrastructure development like roads, construction of guest houses, hotels, bedrooms, vehicle and tent renting to tourists coming to MNP, and greening the area. For example, Bilbo hot spring is vital place for this purpose. People will come there for purposes like healing, recreation, spiritual and secular, conferences, meetings, wedding ceremonies, etc. Thus, all the concerned bodies have to come together to work on issues related to logistics and infrastructures needed to improve the park's facilities.

xiv. *Project*

Maze National Park is a recently established park full of potentials to implement projects on tourism, ecotourism and livelihood development. Projects could be governmental, NGO, private companies, associations and individual projects. The park management needs strong collaboration with stakeholders to have joint projects on Wildlife, Vegetation, Wonja Cave, Bilbo Hot Spring, etc. to bring reliable and feasible ecotourism development in MNP.

IV. CONCLUSION

The study on ecotourism potential, challenges and prospects of Maze National Park is a timely study to develop sustainable ecotourism in Maze National Park. The study revealed that the park has a number of opportunities and prospects to develop sustainable ecotourism. Population pressure, wildlife death and migration, conflict of interest, poor political commitment

and climate change were identified to be the main challenges for sustainable ecotourism in the park.

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Conflict of Interest

The author has no conflict of interest with this publication.

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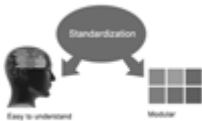
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Key Words

A major linchpin in research work for the writing research paper is the keyword search, which one will employ to find both library and Internet resources.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy and planning a list of possible keywords and phrases to try.

Search engines for most searches, use Boolean searching, which is somewhat different from Internet searches. The Boolean search uses "operators," words (and, or, not, and near) that enable you to expand or narrow your affords. Tips for research paper while preparing research paper are very helpful guideline of research paper.

Choice of key words is first tool of tips to write research paper. Research paper writing is an art. A few tips for deciding as strategically as possible about keyword search:



- One should start brainstorming lists of possible keywords before even begin searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in research paper?" Then consider synonyms for the important words.
- It may take the discovery of only one relevant paper to let steer in the right keyword direction because in most databases, the keywords under which a research paper is abstracted are listed with the paper.
- One should avoid outdated words.

Keywords are the key that opens a door to research work sources. Keyword searching is an art in which researcher's skills are bound to improve with experience and time.

Numerical Methods: Numerical methods used should be clear and, where appropriate, supported by references.

Acknowledgements: Please make these as concise as possible.

References

References follow the Harvard scheme of referencing. References in the text should cite the authors' names followed by the time of their publication, unless there are three or more authors when simply the first author's name is quoted followed by et al. unpublished work has to only be cited where necessary, and only in the text. Copies of references in press in other journals have to be supplied with submitted typescripts. It is necessary that all citations and references be carefully checked before submission, as mistakes or omissions will cause delays.

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<i>References</i>	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



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