Informatics Engineering
of Pasundan University

Faculty Engineering
of Shizuoka University

PROCEEDING
JOINT RESEARCH SEMINAR

4th Campus of Pasundan Universi
Jl. Dr. Setiabudhi No. 193 Bandur
West Java - Indones

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FACULTY ENGINEERING OF SHIZUOKA UNIVERSITY

WITH

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INFORMATICS ENGINEERING OF PASUNDAN UNIVERSITY

PREFACE

Praise be to Allah, who has given mercy so that the research seminar held jointly by the Informatics Engineering of Pasundan University with Engineering Faculty of Shizuoka University, particularly from the Wada Laboratory. This joint seminar aimed at sharing research results in order to mutually utilize the results of the each research lab for the development of each and also explore the possibility of research collaboration between the two sides

From the Shizuoka University, the seminar included Prof.. T Wada as a team leader along with five of his graduate students. While Unpas of Informatics, involving 3 person lead researcher and 5 members. Electrical Engineering Shizuoka University presented five papers whereas Informatics Unpas three papers presented and a final product that is prototype building control system.

Papers from the University of Shizuoka majority of stubs in the area of telecommunications, while the topic from Informatics Pasundan University is Information Society as a result of the development of information technology and telecommunications. The relevance of the paper assosiated with the prospect of future cooperation to include (1) the use of several innovations in the telecommunications field of Wada laboratory to solve problems of telecommunications in rural West Java, (2) knowledge sharing and the lab facility for the manufacture of ICs from the building control system that it's prototype have been developed to be used as mass products (3) sharing knowledge about waste management in Japan's mobile phone.

We say many thanks to :

1. Prof. Dr. Eddy Yusuf who has facilitated for this seminar
2. Dr. Lili Satari who have initiated and arrange Seminar.

3. Dr. Yudhi Garnidha who has supported the research team informatics engineering pasundan university and pleased welcome to the team from Shizuoka
4. Drs. Dadang Bainur, which have helped the event welcoming to the team from Japan

In this proceedings was published 8 papers presented and discussed at the seminar shared the results of research among Informatics Engineering Pasundan University (4 papers) with the Faculty of Engineering, University of Shizuoka, especially from the Wada Laboratory (4 papers).

I hope these proceedings provide benefits to both parties who have worked together and also to the readers.

Best Regard,

Ririn Dwi Agustin
Head of Informatics Engineering UNPAS

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INFORMATICS ENGINEERING
OF PASUNDAN UNIVERSITY
WEST JAVA - INDONESIA

Model Optimization for Winner Determination in Combinatorial Auctions – Simultaneous Multi Object

(Frequency Auction Case Study)

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Abstract

Spectrum, with its characteristics, requires a specific auction scheme to avoid the problems that occur as *winners curse* and *free rider problem,* especially the *complexity computation* problem. One of the auction schemes is the combinatorial auction with multi-object objects. The problems that arise in this auction scheme is an explosive combination of offerings that should be set as the winner. In this study, combinatorial problems are mapped as the Knapsack problem so can be solved with the idea of brute force approach or the heuristic approach with Genetic Algorithms. With brute force approach, the problem mapping is more simple but high computational complexity. While the idea of genetic algorithm approach, the problem representation becomes more complicated, but it ensures a lower computational complexity.

Keywords: spectrum, spectrum auction, combinatorial auction, knapsack problem, brute force, genetic algorithms.

A. Preliminary

1. Background

Radio Frequency Spectrum is a limited natural resource that has strategic value in telecommunications and dominated by the state. Radio Frequency Spectrum Utilization as a natural resource needs to be done in an orderly, efficient and in accordance with its designation so as not to cause harmful interference.

The need for speed development, flexibility and mobility, from time to time, has encouraged the increasing needs of radio frequency spectrum for wireless-based technology services. To meet the needs of data and Internet access service, since 2000 the Indonesian government has allocated radio frequency spectrum for BWA services consisting of BWA bands exclusive and non-exclusive.

There are a number of organizers who have obtained an exclusive allocation license of BWA frequencies previously granted based on the mechanism of "first come first served". This mechanism cannot be applied again when more demand for the allocation of frequency operating license. Therefore mechanism of "frequency spectrum auction" / spectrum auction becomes an alternative mechanism in frequency licenses request compliance.

2. Problem Identification

Specific characteristics of the frequency spectrum require a specific auction mechanism. Among other things, the frequency blocks on offer / bid to the extent possible contiguous placed side by side. This cause the block of frequencies being auctioned should be made packaging, so the auction is held to give per frequency package/package bidding. This is called a *combinatorial auction,* where every participant will win the bid as "all or nothing" to the auction object packages that they bid. Wide frequency spectrum should be split into blocks of homogeneous frequency which is then offered to

enthusiast frequency service providers. Blocks can be assigned a unique identity, so that each bidder can specify a block of interest.

To make an adequate competition, the auction should be held not once, but in some rounds. This gives opportunity for the bidders to bid several times. With so many frequencies objects / blocks are auctioned, bidding should be held simultaneously, to facilitate bidders in making bids. Thus, the auction must be held *simultaneous combinatorial auction*. In each round, the bidders allowed to bid / bidding more than once for packages of different offerings.

Other problems are of the operating license, due to the vast Indonesian state, then the permit may be granted on a regional per zone. Zones in Indonesia is broken down into several zones. Thus, the frequency of bid package consists of a block and a particular zone. At this time, the zone applied for 15 regions, but did not rule areas across Indonesia are grouped into 5 zones based on the islands. To improve efficiency, zoning can be implemented into only 3 zones, the form of West, Central, and Eastern.

As can be seen that there are requirements in the spectrum auction: packaging, repeated rounds of auctions, blocking, and zoning. These requirements will impact on the incidence of computing complexity problems, especially when determining the winner of the auction in each round. There are three variables that affect the complexity of each bid in each round, ie the number of bidders, the number of blocks, and the number of zones. Of the three parameters there will be combination offers explosion / bidding which influences the size of the search space in determining the optimum combination of offerings. As an illustration, four bidders; then there will be a $2^n - 1$ *combination;* so computational complexity is O^n *where n is the number of bidders.* If the license arrangements for the set per regional / zone off each other, then it would require more combinations to the area to be auctioned. If Indonesia is broken down into 15 zones, there are $15 \times 2^n - 1$ *combination.*

3. Purpose

The purpose of this research is to create a model for the optimization of the determination of the winning bidder, for the most simple case until probably the most complex. A simple case if the number of bidders <5, a homogenous block / not unique, and zone = 3, while the most complex cases if the number of bidders> 20, a homogeneous blocks with identity / unique, and zone = 15.

A deterministic method used by the *brute force* method, and will be used for comparison with *genetic algorithm* heuristic methods.

B. Methodology

Here is a picture of the methodology used in this study :

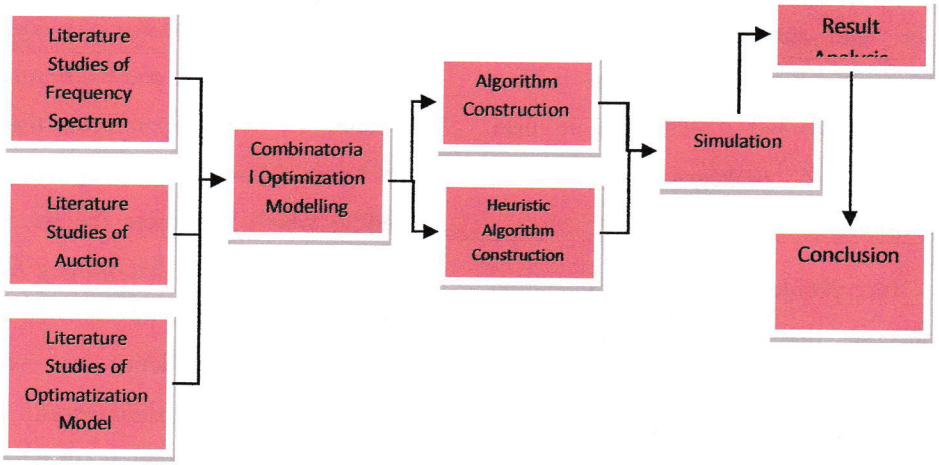

Figure 1 Research methodology

The research begins by studying literature related to the frequency spectrum, auction, and the optimization model. Once it's done modeling of optimization problems contained in combinatorial auctions. Construction algorithm is then performed based on the combinatorial model, consisting of brute-force algorithms and heuristic algorithms. Both performed simulations to illustrate the problem of the same

Utilization Strategic of Information and Communication Technology for Rural Community Empowerment in West Java

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Abstract

Utilization of Information and Communication Technology (ICT) for business interests in urban areas has become imperative in order to compete with competitors. Due to the considerable gap in the provision and use of ICT between urban and rural areas lead the digital divide. Utilization of ICT in urban areas may not be entirely suitable for rural areas because of a number of factors that influence it. So many rural villages with a variety of classifications that exist in Indonesia generally and in West Java in particular, each community has a level of maturity in accepting different ICT anyway. In order to utilization of ICT in rural areas it can run effectively, it is necessary to measure the maturity level of each village. So that could be made an ICT implementation strategy in accordance with the maturity level of each village.

Keyword: ICT, Measurement Maturity, Strategy, Rural Community Empowerment.

1. Preliminary

1.1. Background

1. Potential village,
2. Development of communications and information technology,
3. Utilization of mobile phones (mobile / mobile) are increasingly widespread, from the number of users and uses, not just for communication
4. Mobile phone and pulse rates are more affordable

1.2. Problem Identification

1. Low mobilization (note: due to large areas, the population are rarely / scattered)
2. Inadequate transport infrastructure
3. low economic value of rural outcomes because of limited transportation and information

1.3. Objective

Purpose:

1. Measuring the level of maturity villagers in West Java in readiness to receive and use ICT.
2. Utilization of information technology to formulate strategies for empowering rural communities with access to media mobile phone (note: includes government policy, governance, infrastructure, content, implementation strategies).
3. Developing a prototype information technology for rural communities in accordance with the potential dominant villages concerned.

Benefits:

1. Empowering communities in rural communities to enhance the economic value of rural outcomes with improved means of communication and access information quickly and cheaply

1.4. Scope

1. Village that became the subject of research is the villages that the area has already covered by cellular service.
2. Parties are empowered in the village is a community of indigenous and rural economic powerhouse.
3. The village is used as model is coastal villages, agriculture and industries that exist in each of the villages.
4. The prototype includes content, software applications, governance, and strategy implementation.

2. Methodology

1. Defining the village, cellular technology, community empowerment, IT intervention strategies.
2. Formulate measure for classifying villages according to the readiness to accept information technology (e-readiness) (Phase II). (Note: there are six factors according to the EIU (economist intelligent unit) & IBM as connectivity, business environment, social and cultural environment, legal environment, government policy and vision, consumer and business adoption).
3. Formulate intervention strategies for the empowerment of rural communities IT.

3. Reference

3.1. Understanding of the Village

1. Backward Village or 'Swadaya' Village

   Backward Village is the village that lacked of human resources or labor as well as a lack of funds and is unable to exploit the potential that exists in the village. Backward villages usually located in remote areas far from the city, and the poor living standard of traditional and do not have the facilities and infrastructure supporting an adequate.

2. Developing village or 'Swakarsa' village

   Developing village is the villages are starting to use and exploit the potential of physical and nonphysical owned but still lacks the financial resources or funds. This village has not been a lot of rural infrastructure which is usually located in remote rural areas of transition and urban area. In this villages education levels are still low.

3. Developed Village or 'Swasembada' Village

   'Swasembada' village is the villages that were well advanced in terms of human resources and also in terms of capital funds. so it's been able to harness and use all the potential physical and nonphysical village maximally. 'Swasembada' village life was like a modern city with the work of diverse livelihoods and facilities that are complete enough to support rural community life forward.

3.2. Government policy in overcoming poverty

The Government of the Republic of Indonesia has set a long-term plan (year 2004-2015) to alleviating poverty, which will be presented in Working Paper SPKN. In accordance with government policy, Poverty Reduction Committee has formulated two main approaches towards poverty reduction, namely:

a. Adding the income of the

poor by increasing productivity and managerial ability and help them gain opportunities and better social protection in order to achieve social status, economic, and better political

b. Reduce financing basic such as education, health, and infrastructure-in order to support social activities and economic development.

3.3. ICT in Development in Indonesia

In Indonesia, exploiting the potential of ICT to assist government efforts to reduce poverty is still very rare. Now is the perfect time to revive the fight against poverty in Indonesia with the empowering role of ICTs in national development, coupled with other measures taken to reduce poverty.

ICT strategy is urgently bringing together the three main developments in Indonesia which will be united together into a powerful force for improving the lives of the poor in Indonesia. First, the ICT strategy will strengthen the national commitment to embrace and exploit ICTs under the auspices of the National Framework for Information Technology (National Information Technology Framework). Second, the ICT strategy will enhance national efforts to reduce poverty as stated in SPKN. Third, implementation strategies that take advantage of a decentralized approach will encourage the transfer of roles and responsibilities of central government to the local level.

3.4. ICTs to help alleviate poverty

ICT helps effectively proved successful efforts to reduce poverty in the developing countries, such as Peru, China, Solomon Islands, Zimbabwe, and India.

The experiences and lessons learned from similar efforts elsewhere shows that ICT is most effective when used as a tool for development, support development strategies that have been implemented or will be prepared, than if ICTs are expected as a fruit or a result of development itself. Therefore, the ICT strategy offers additional moves to complement the technology is applied, in order to better ensure its effectiveness in fighting poverty.

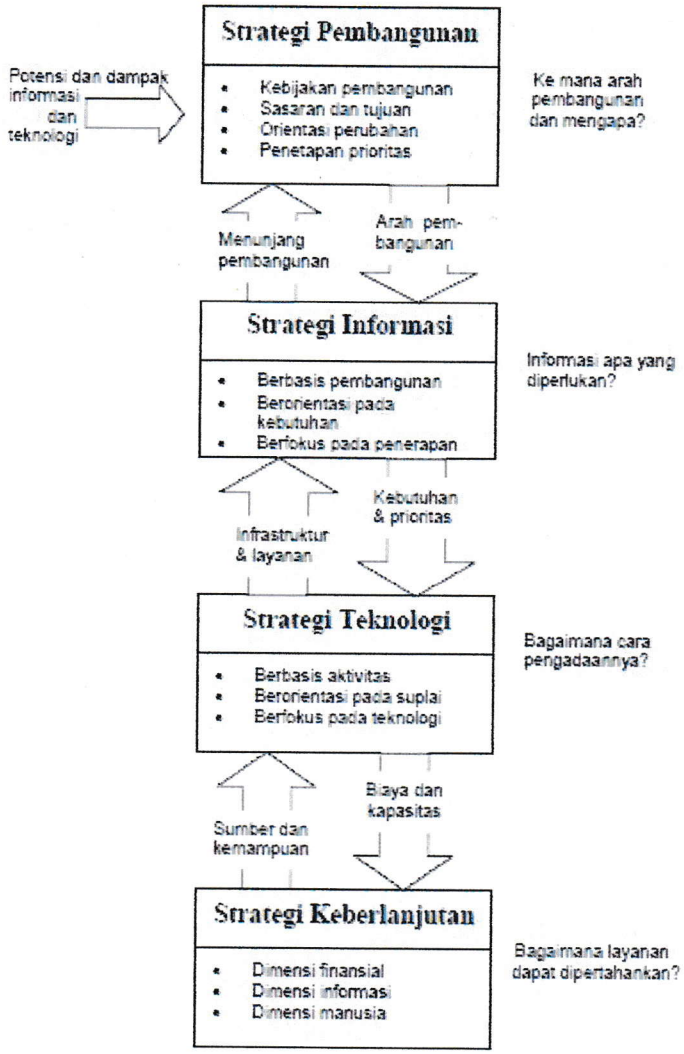
ICT optimum results would be obtained if the technology is embedded in a development strategy that spans the 'hierarchy is telling. Otherwise, ICT will only be a problem-solving, and their impact is less certain. The relationship between ICT and Development can be seen in Figure 1.

To encourage the development of ICT strategy in Indonesia, then a number of related observations and lessons can be drawn from the experiences elsewhere are applying the potential of ICTs should be considered:

1. By themselves, ICTs can play a role not optimal

   If there is no surefire strategy development, then ICT cannot be expected to provide optimum results. Both the causes of poverty, as well as the needs of the poor and the marginalized should be targeted precisely, especially pertaining to women and children. Each discourse that use ICTs in an effort to reduce poverty requires that the proponent defines the supporting elements that are essential to achieve the desired results.
2. ICT is best harnessed to improve the processes that have been going pretty well

ICT development cannot fix a failing, but ICT can make a successful development for the better. Technology is just one component in development. There are a number of other components that must function effectively so that technology can make a contribution. Component which has been running well in development, will contribute even more effective when using ICT. If used incorrectly, ICT will only add to the burden of unnecessary costs and will lead to frustration among users and advocates if the expected results did not appear, thus inhibiting further attempts to utilize ICTs.



3. ICT users are usually the ones who are already familiar with ICT

   At the time of ICTs are introduced then the person will soon be able to use it. The first group to embrace the technology is usually the ones who educated, capable, and who realize its usefulness. That fact may have a positive impact, but the risk of setting aside the uneducated, who could not afford, and who are not aware of its usefulness. Therefore, intervetion of ICT must be conformity with care Of poverty

mechanism, targeting especially those who are less fortunate, to share with them the advantages that ICT can be given.

4. Effective application of ICT involves both technology infrastructure and information infrastructure

   Mobilize the sources of information into an integrated infrastructure and methods require very different skills needed to build the technology infrastructure. ICTs can be an effective tool to fight poverty, but the spread of technology should not be a final destination. Radical changes in organizational roles and responsibilities will occur; for it need to be enforced mechanism that can change the management mechanism is less effective. These measures usually require direct intervention from the government.

5. In rural areas of developing countries (*which is predominantly residential*), installation and maintenance of technology infrastructure is relatively easy compared to the procurement of information infrastructure.

   Infrastructure of Indonesian is poor and retarded. Creatively tackled urgently is needed, in order to realize the connectedness (connectivity) of rural communities. Many island communities are still not connected via cable telephone facilities, especially with the Internet. The solution of the problems can be a very technical challenge, so that technicians need to be deployed reliably available. However, no matter how creative and efficient technology, implementation will always be judged from the results of its application. Nevertheless, the technological challenges should not divert attention from the main purpose of building information infrastructure.

6. With ICT, we deserves hope; even the unexpected can emerge as a result

   Implementation of ICT brings its

own dynamics and projects must recognize that the application of technology will change the dynamics of the problem. For example, can be obtained results that was never expected, but it was better than expected. That happens when people apply the technology themselves according to their needs, which may not be planned by the proponent. Things like that just good, indicating the success of interventions in response to social needs.

7. ICT may open opportunities for development, but the expected result always comes from human activities

Information infrastructure, and especially the people in it, builds an environment that holds the key determinant of quality results. If the main focus on technology, there is a tendency to forget the human element. Education and skills are key to the effectiveness of the use of ICT opener, but so are the attitudes of the person. Therefore, the implementation of ICT requires an effective method to change them.

3.5. ICT in Development Effectiveness

There are certain activities — especially in effort to reduce poverty— that can be optimalized by ICT. Correlation these activities with the four pillars of poverty reduction made by the Government of the Republic of Indonesia can be seen in Table 1.

Table 1. Correlation ICT with Goverment Effort to Reduce Poverty

Field activities to be optimized with ICT	**Four Pillars Of Poverty**			
	Creating job opportunities	Empowering People	Increasing competence	Creating Social Protection

Field activities to be optimized with ICT	Four Pillars Of Poverty			
	Creating job opportunities	Empowering People	Increasing competence	Creating Social Protection
1. Empowering disadvantaged and marginalized people		√		
2. Stimulating mikro entrepreneurial	√		√	
3. Improving long-distance health information services (*telemedicine*)				√
4. Improving education through e-learning & lifelong learning	√		√	
5. Developing trade through e-commerce	√			
6. Creating a public administration more efficient and transparent through e-governance				√
7. Developing capability			√	
8. Enriching culture		√		√
9. supporting agriculture	√		√	
10. Creating job opportunities	√		√	
11. Encourage social mobility		√		√

3.6. Information Evolution Model

Information Evolution Model by Jim Davis and friends defines five evolution steps consist of how a company manage and use information. Model defines four dimensions for each step of Infrastructure, Knowledge Process, Human Capital, Culture that have a role to increase or decrease the value of a business information.

Tabel 1. **IE Model : Level dan Dimensi** Sumber J. Davis et.al-2006

Level	Infrastructure	Knowledge Process	Human Capital	Culture
Operate	Manual system or Non-network PC	Personal	Individual	No
Consolidate	Functional System	Departement	Functional Group	Our group vs 'the rest of the company'
Integrate	Enterprise System	Enterprise	Enterprise Group	All of us
Optimize	Extended Enterprise System	Extended Enterprise (Memperluas)	Extended Group	Our partner and us
Innovate	Adaptive System	Situational matrix	Dynamic Network	Adaptive Grouping