First Step toward Establishing Microsoft Research Centre in Indonesia

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ABSTRACT

This research started when President Yudhoyono visited USA and met with Bill Gates back in 2005. President Yudhoyono later asked Gates to establish Microsoft Research Centre in Indonesia to promote the Indonesian ICT industry. Later that year, the Indonesian Government signed a MOU with the Microsoft Research Centre Asia in Beijing to extend the cooperation between Microsoft and the Indonesian Government. The MOU later took form as Microsoft Innovation Centre in ITB and ITS. The problem arises whether Microsoft will build the Microsoft Research Centre in Indonesia? Will Indonesia be able to become a leading software exporter? How the Microsoft Research centre will someday established in Indonesia. This research later focused on establishing an R&D facility in developing countries. The main concern is Microsoft research center due to its latest agreement with the Indonesian Government. The dilemma facing Microsoft research center establishment in Indonesia is analyzed using Actor-Network Analysis. The software used for this analysis is DANA (Dynamic Actor Network Analysis).The data for input of the software was gained through interviews and secondary data gathering. The issue discussed is whether ITB should involve in establishing Microsoft research center Indonesia or not. The result show that ITB should involve in minimum capacity. The result using simulation and benchmark suggest that Microsoft should begin the establishment of a research centre in Indonesia, not the other way around i.e. academics (ITB) as the primary mover. The Indonesian Government should also induce foreign knowledge-based companies to invest in Indonesia.

***Keywords**: Microsoft research centre, feasibility study, technology transfer*

1. Background

1.1 Background of research

Last May 2005 the Indonesian President, Susilo Bambang Yudhoyono, visited USA. During his stay, he also met some American's top entrepreneurs/businessmen and one of them was Bill Gates, the owner of Microsoft. On this meeting, he invites Microsoft to set up the fifth Microsoft research center in Indonesia. Through this research center it is hoped/aimed that Indonesia will benefit the establishment of Indonesia, as one of the advanced on information technology countries. This will also leverage the growth of software industry in Indonesia.

As follow up of this meeting the Minister of Research and Technology, Kusmayanto Kadiman, invited the rector of ITB and the rector of ITS to discuss the follow ups of President Yudhoyono initiatives and furthermore Minister Kusmayanto appointed ITB and ITS to realize Coop Project with Microsoft.

Microsoft's R&D spending for the year of 2005 is moderately lower than 2004, when they spent almost $8 billion on R&D, and became the biggest corporate spender on R&D. But it doesn't mean now Microsoft goes soft on R&D and innovation. In November 2006, they just release their digital music player, Zune, followed by the up coming Windows Vista (Business Week, Dec 4th2006). Just this year, at the beginning of the year, they have just launched their XBox360, the latest product of Microsoft's Gaming Console. All of this proves that Microsoft is very keen in research and development and they have big cash to back that up. All of this show Microsoft prowess for building strong knowledge based products and services trough R&D.

The Top 20 alone spend over $115 billion annually on R&D

Rank	Company	R&D Spend ($M)	Geography	Industry	R&D / Sales	% Change over 2004	2004 Rank
1	Ford	$ 8,000	North America	Auto	5%	8.1%	3
2	Pfizer	$ 7,442	North America	Health	15%	-3.1%	2
3	Toyota	$ 7,178	Japan	Auto	4%	7.6%	5
4	DaimlerChrysler	$ 7,019	Europe	Auto	4%	-0.2%	4
5	General Motors	$ 6,700	North America	Auto	3%	3.1%	6
6	Siemens	$ 6,546	Europe	Industrials	7%	10.9%	7
7	Johnson & Johnson	$ 6,312	North America	Health	12%	21.3%	10
8	Microsoft	$ 6,184	North America	Software & Internet	16%	-20.5%	1
9	IBM	$ 5,842	North America	Computing & Electronics	6%	-0.5%	9
10	GlaxoSmithKline	$ 5,700	Europe	Health	14%	8.0%	11
11	Samsung	$ 5,428	Rest of Asia	Computing & Electronics	7%	12.4%	17
12	Intel	$ 5,145	North America	Computing & Electronics	13%	7.7%	12
13	Volkswagen	$ 5,071	Europe	Auto	4%	7.5%	13
14	Sanofi-Aventis	$ 5,025	Europe	Health	15%	NA	31
15	Matsushita	$ 4,989	Japan	Technology	6%	-8.2%	8
16	Novartis	$ 4,846	Europe	Health	15%	16.2%	18
17	Nokia	$ 4,753	Europe	Computing & Electronics	11%	1.3%	15
18	Sony	$ 4,698	Japan	Computing & Electronics	7%	5.9%	14
19	Roche Holdings	$ 4,578	Europe	Health	16%	10.7%	19
20	Honda Motor	$4,508	Japan	Auto	5%	9.1%	16
Total		$ 115,965			7%	5.8%	

Source: Booz Allen Global Innovation 1000, 2006

1.2 Current Development

The latest development on Microsoft and ITB collaboration is the establishment of Microsoft Innovation Center (MIC) in May, 2006. The MIC is established in the ITB campus. ITS had preceded ITB in establishing MIC a month earlier.

Exhibit 1
Microsoft Innovation Centre Launching in ITB - July 2006

Exhibit 2
Microsoft Innovation Centre ITS - August 2006

1.3 Problem scope

The problem remains, how should ITB act in the future especially in regarding the establishment of Microsoft Research Centre in Indonesia? What role should ITB play? How the establishment of Microsoft Research Centre Indonesia would finally propel Indonesia to world-level software exporter?

2. Methodology and Literature Review

2.1 Research methodology

The research started with problem formulation. The importance of Microsoft Research Centre in Indonesia, ITB role in the establishment of that research centre are the main focus of this research.

The research later continued with data gathering through interview with ITB Informatics Lecturers about ITB stance, research ability and later with SBM lecturers about Indonesian ICT business. Data are also gathered from secondary sources, through the Internet and other literatures.

ITB self-analysis later conducted to measure the strength, weakness, opportunity and threat of ITB. The result of this assessment is a list of products and fields in which ITB could thrive and later established strong-solid base for Indonesian ICT competitiveness. Microsoft Research Centres throughout the world are later benchmarked. The research fields of each MRC are mapped, compared with ITB potentials to later result the fields and products. The pattern of these R&D centres establishment is also benchmarked to give proper judgment for the DANA simulation.

Dynamic-Actor-Network-Analysis simulation later conducted to provide good strategic decision for each actor involved in this research. Finally, after considering all of these results, conclusion could be drawn. Later, the roadmap for ITB can be suggested. The methodology is summarized in Exhibit 3.

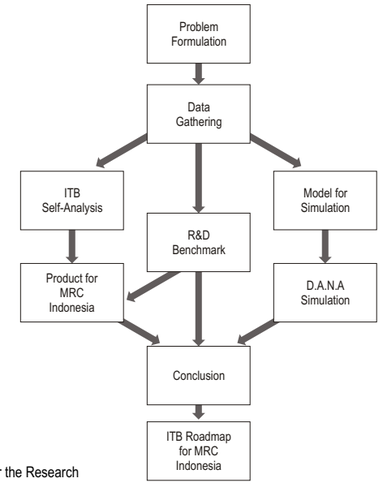

Exhibit 3 Methodology for the Research

2.2 Research Centre Benchmark

There are two types of R&D centre abroad with their centre abroad with their characteristics:

- The first type of site, *home-base-augmenting site*,
  - is established in order to tap knowledge from competitors and universities around the globe
  - Information flows from the foreign laboratory to the central lab at home.
- The second type of site, *home-base-exploiting site*,
  - is established to support manufacturing facilities in foreign countries or to adapt standard products to the demand there
  - Information flows to the foreign laboratory from the central lab at home.

EXHIBIT 2 Establishing New R&D Sites.

Types of R&D sites	Phase 1: Location decision	Phase 2: Ramp up period	Phase 3: Maximizing lab impact
Home-base-augmenting laboratory site: Objective of establishment: absorbing knowledge from the local scientific community, creating new knowledge, and transferring it to the company's central R&D site	—Select a location for its scientific excellence —Promote cooperation between the company's senior scientists and managers	—Choose as first laboratory leader a renowned local scientist with international experience—one who understands the dynamics of R&D at the new location —Ensure enough critical mass	—Ensure the laboratory's active participation in the local scientific community —Exchange researchers with local university laboratories and with the home-base lab
Home-base-exploiting laboratory site: Objective of establishment: commercializing knowledge by transferring it from the company's home base to the laboratory site abroad and from there to local manufacturing and marketing	—Select a location for its proximity to the company's existing manufacturing and marketing locations —Involve middle managers from other functional areas in start-up decisions.	—Choose as first laboratory leader an experienced product-development engineer with a strong companywide reputation, international experience, and knowledge of marketing and manufacturing	—Emphasize smooth relations with the home-base lab —Encourage employees to seek interaction with other corporate units beyond the manufacturing and marketing units that originally sponsored the lab

Exhibit 4 Establishing R&D Site (Bulgerman, et.al. 2001)

From these two R&D type, the research will identify which one correlate best with Microsoft's R&D centre throughout the world. The characteristic of Microsoft Research Centre Asian Beijing, China will become the main focus due to its proximity to Indonesia and because of the fact that this R&D centre is the largest Microsoft Research Centre abroad.

2.3 Product Benchmark

For deciding which fields and products that should be developed by Microsoft Research Centre Indonesia, if yet tobe established one day, the following appraoch is used:

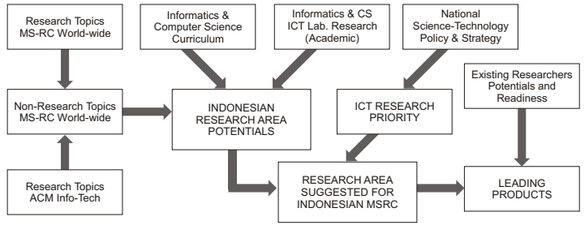

Exhibit 5 An Approach - Model to Determine the MSRC Research Centre Topics in Indonesia

Explanation to the Model:

Every Microsoft Research Center (MSRC) has own unique research area/topics. Therefore the one that will be built in Indonesia should be different than the others. To search that "different things", reference from the Special Interest Groups (SIGs) from Association for Computer Machinery (ACM) were used. The Research area available in ACM and not yet in MSRC later cross-studied against the Indonesian Informatics and Computer Science curriculum and supporting labs so in the end the research potentials for Indonesia discovered.

The next step is to compare the research potentials to the ICT Research Priority accordingly to the National Policy and Strategy. In the end there would be research area/topics different from other MSRC, supported by the Indonesian Researchers and accordingly to the National Policy and Strategy

For ITB, the important phase in this approach is ITB self-analysis of potentials and readiness. The products that later suggested are tailored to the needs of Indonesia, as decided by the Indonesian Government, and also capable to be build or engineered by ITB.

2.4 Exporting Software framework

Heeks and Nicholson(2002) says that the development of a nation in exporting software could be described in the following framework:

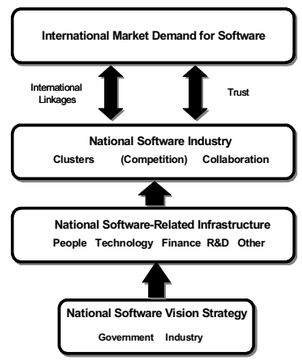

Exhibit 6 Export Success Mode (Heeks&Nicholson, 2002)

The Framework based on five (5) parameters:
Demand for Software, National Software Strategy and Vision, International Linkages and Trust, National Software Industry Characteristics and National Software Related Infrastructure. Each of the parameters will be described as follows:

Demand for Software

For all three industries, the nature of demand has been critical. As already noted above, the global software market has registered average double-digit growth for the past twenty years. There has also been a huge gap between demand for, and supply of, software labor. This has created a strong pull into the market. It is also very forgiving of delays, errors, problems, etc.

The importance of domestic demand is less clear. Both India and Ireland, with their service-related focus, have relatively weak or small domestic software markets. There is evidence that this has helped push software firms into exports (Heeks 1996). On the other hand, the presence of a domestic market in both countries has attracted foreign investors who set up linked software export operations. Israel, with its product-related exports, is possibly different. It has made use of a relatively sizeable and demanding domestic market as the springboard for exports. Nevertheless, as noted above, the Israeli software industry is export-dominated.

National Software Strategy and Vision

Heeks and Nicholson argue that all major exporter of software from the third world nations, namely the three-Is (India, Ireland, and Israel) all have national strategy to promote their software industry to the world level. They analyze that the vision and strategy has emerged back in the 70s when the industry is still at infant stage. These countries have begun their first step by setting the goals toward exporting software. Their observation later concluded that after 20 years the whole effort put in back in the 1970's bringing tangible results.

They observe that all of the three-Is countries develop the vision and strategy as iterative steps not just one final big vision for the future. They adjust their strategy and vision as well as they put themselves strategically in the world software market. When they have found their niche they build their competence. Heeks and Nicholson also identify that these vision is not just prepared and executed by the governments, the private sectors also involved. This collaborative action built national readiness to become the real global player.

International Linkages and Trust

In order to export goods or services one must have a customer that positioned not in one's home land, but abroad. But, having a customer in another country is not good enough for an exporter to hold on and build his business. To do so he must build trust to ensure longevity of his business with his customer abroad. This is when major consideration Heeks and Nicholson say as International Linkage and Trust come in. They argue that without this trust and linkage, software exporting nations would not be able to thrive.

To be able to build that trust, Heeks and Nicholson argue that the linkage and trust was built long ago when these countries ancestor Diaspora throughout the world, mostly to the United States. When their home nation flourished, some of them returned, building a business in their homeland. With the previous linkages they have in the market (US, UE), when they try to export the software they have the "connection" needed to win the market.

But, building a connection and maintain one is a different story. What have been great for these nations (the three-Is) is that they have been able to maintain than connection and build the trust they need to endure a period of time to build themselves as a world player. These efforts are not easy, Heeks and Nicholson summarized in their report. They have to build on time, reliable and budget accurate software to be able to maintain these linkage and trust, and they have.

Further down the road, there's an issue that also count as major threat for this linkage, The Intellectual Property Protection. The US and UE consider third world nations as pirates of the intellectual property. These leading world exporters have built strong image as the Intellectual Property guarantor. Their governments have worked hard to put this image and the private sector also upholds this trait, resulting good synergy for the industry as a whole.

National Software Industry Characteristics

There are three factors describing the National Industry characteristics as shown by the three I's, namely competition, clustering and collaboration. Heeks and Nicholson describe those factors as follows:

> "All three industries are dominated by privately-owned firms (often, as seen above, involving some foreign capital), and concentration ratios have been relatively low. Thus, all three involve hundreds of firms, typically of medium size (50-500 staff) competing relatively freely with each other. *Competition*, though, should not be oversold. At least in services, the massive global gap between demand and supply for software labor has left many Indian and Irish firms pushing at an open door and finding inter- firm competitive pressures relatively weak. The result has been reduced pressure to innovate or differentiate. The second characteristic has been *clustering*. Most software export firms in the 3Is cluster around a few locations: Bangalore, Mumbai, Chennai, Delhi and Hyderabad in India Dublin and Cork in Ireland and Tel Aviv, Haifa and Jerusalem in Israel. Clustering has brought a number of benefits: rapid interchange of information and knowledge (about best practices, about market opportunities), locational economies (it is cheaper to provide infrastructure in all its forms to a cluster of software firms than to the same number of firms that are scattered), and a raised marketplace profile. Government has supported these efforts by helping bring infrastructure to the clusters. The final characteristic has been *collaboration* the ability of software firms to work together in areas of mutual benefit such as policy advocacy, overseas marketing, market research, and distribution of best practice. This has typically been enabled by the software industry associations and effective government agencies found in all three countries."

National Software Related Infrastructure

Heeks and Nicholson describe the three-I's Software Related Infrastructure as the following:

People

More than any other factor, software relies on people. Probably the 3Is' number one critical success factor has been the skills and expertise and size of the local labor pool. In part, this may be pre-existing India and Israel had strong scientific and technical establishments (including defense) since the 1950s. In part, though, labor has been developed through deliberate government intervention to build the IT skills base, especially at tertiary level, where all three have had and have strengthened excellent technical education institutions.
At first sight, labor costs might seem to be central to software export success for the 3Is. While they have clearly been important, they need to be set alongside, rather than above, other factors. Survey evidence shows clients rate skills and the ability to close their labor demandsupply gap as more important than costs. Evidence from Ireland shows continued software export growth despite labor costs that can exceed those of neighboring countries and Israel's software sells because of its quality and reputation rather than price. Two other human elements figure in the 3Is' success. The first is English, the global business and IT language, and also not coincidentally the language that dominates higher education and, to a significant degree, business in all the 3Is. The second is knowledge. Initially through the Diaspora but later through exports and client linkages, staffs in 3I software exporters have built up a strong knowledge base: about overseas software markets, about overseas business norms and practices, and about specific customer needs and values. This has put them in a strong position to sustainably-grow their software export business, whether in services or products.

Technology

Both Ireland and Israel have benefited from a strong technological infrastructure of both hardware/software and digital telecommunications that (at least in cluster locations) is equivalent to client country norms. This can be put down to liberalization combined with government and foreign investment. In its early years, India's domestic technological base was a critical weakness, not success factor. Hence, the reliance on body shopping is a way of short-circuiting that weakness. Since 1991, government investments have grown and liberalization has increased the involvement of private funds and foreign investments in the technological infrastructure. Barriers to such investments, including import tariff barriers, have also been reduced. As a result, cluster-centered infrastructure now approaches that found in some Western countries

Finance

Governments in all three countries have acted to stimulate the supply of working and venture capital to software firms. All three have used a raft of tax breaks, marketing subsidies, grants, loans, legislative updates and removal of red tape in an effort to achieve this a combination of both liberalization (less government) and promotional intervention (more government). Israel

particularly has brought all these together with infrastructure and advice in a set of high-tech 'incubators' that have helped boost export earnings. All three countries have also benefited from heavy investment s of overseas aid that has been channeled into infrastructural investments. This has come from the international donor community in India's case via the European Union for Ireland and from the US for Israel.

Research and Development

All three countries have invested in software-related research and development, directly via government and indirectly via tax breaks for private sector R&D. In all cases, this has brought at least some indirect benefit for the human infrastructure building skills and knowledge. The innovation benefits have varied. In product focused Israel, with the highest R&D investments of the three, they have been crucial. Government-subsidized multimedia projects have been spun off into everything from games to business and home applications. Military- funded developments in signal processing and encryption have emerged in a variety of Internet communication and security packages. In service- focused India, success stories especially commercialization of publicly-funded R&D are few and far between.

Other

Governments in the 3I nations have helped by providing or enabling an infrastructure of transportation (road and air), utilities, and business accommodation, especially to software export cluster locations. They have also assisted the knowledge infrastructure of ideas and best practices in their support for ISO9000s and for software Industry associations.

2.5 Dynamic-Actor-Network-Analysis

This research is conducted through computer simulation using DANA (Dynamic Actor Network Analysis) software created Pieter Bots form TU Delft Netherlands. The software was designed for analyzing possibilities in policymaking. The input is gathered from secondary data and observation

The software analyzes the actor's attribute, decision or action, and also goals. The conflicts present are resolved through best strategy and decision by the actors. The best strategy and decision is the one which gives the highest satisfaction level. Although win-win solution is not always present in the most decent and simple form, there's always a solution for a problem.

The Actor-Network begins with determination of actors involved as stakeholders in the current issue. The actors were given attributes and goals to describe what really happened in the real world. Connections between factors and actors were made considering the impacts given to each other.

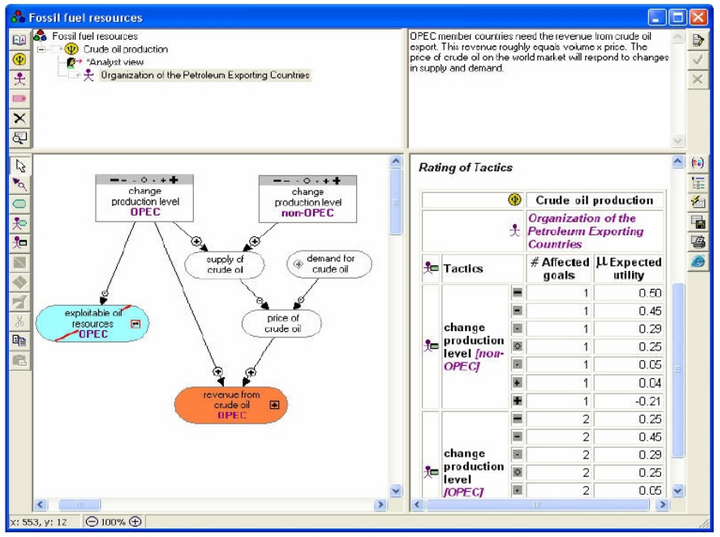

Exhibit 6 DANA Software Interface (Pieter Bots, TU Delft)

3. Results and Discussion

3.1 Research centre benchmark

Microsoft Research Center in Asia established in 1998 by the vision of Nathan Myhrvold, then Microsoft chief technology officer. The Research center first managing director was Kai-Fu Lee. Microsoft by 2005 has invested $100 million in Microsoft Research Center Asia. (Huang, et al, 2006) This makes Microsoft Research Centre Asia - China the largest abroad Microsoft Research centre in the world, comparing to England's Cambridge or India's Bangalore.

Staffing for Microsoft Research Center Asia consists of 1/3 of star researchers, 1/3 of middle researchers, and 1/3 rising star college graduates. The whole researchers, which divided into five fields of researches, bring up the total number to 500, plus an additional 300 interns. These interns come from all over China.

In greater Beijing area where Microsoft Research Center Asia located, there are 1000 technology companies. Microsoft Research Center is a seven stories building within the proximity of twelve universities, with two most renowned universities in China, Beijing University, and Tsinghua University. Tsinghua University is the place for Microsoft Research Center recruits most its researcher. The main reason why Microsoft Research Center located in Beijing is Beijing's strong academic surrounding and talents. “Beijing students are more research oriented than their counter parts in Shanghai”, Kai-Fu Lee explained regarding the selection of Microsoft Research Center Asia location. (Huang, et al, 2006)

The current structure of Microsoft Research Center Asia is described as follows:

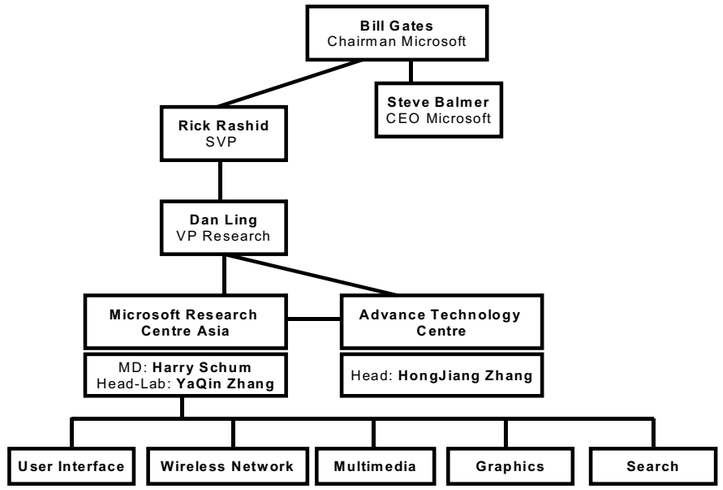

Exhibit 7 Structure of Microsoft Research Centre Asia (Huang, Buderi, 2006)

Giving all the terms above, it is clear now that Microsoft put their R&D centre abroad not to exploit what they have in the home-base R&D centre, Redmond, but to augment the home-base R&D capability. Exhibit 8 shows that Microsoft researchers are almost evenly distributed between the US and non-US R&D centre. This also amplified with Table 2. Each Microsoft Research Centre has spesific research area and designated to augment the Microsoft home-base R&D.

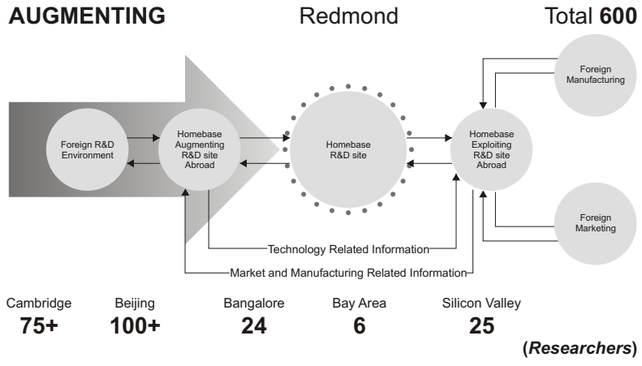

Exhibit 8 Microsoft Research Centre around the world: Augmenting home-base R&D (*analyzed from Microsoft Research website*)

NO	MSRC	Research Area / Focus
1	Redmond (USA)	from new hardware designs and artificial intelligence to the theoretical mathematical underpinnings of computer science
2	Bay Area (USA)	study of scalable servers, large databases, spatial databases, and the future of personal media management/enhancement
3	Beijing/Asia (China)	advanced user interface, networking and wireless, next-generation multimedia, and Asian information processing technologies
4	Cambridge (UK)	basic computer science research on a wide variety of topics, including machine learning, security, information retrieval, operating systems, programming techniques and networking
5	Silicon Valley (USA)	Distributed Computing -- including privacy, security, resource location, protocols, the Internet as a platform, reliability, availability, scalability, management, and related theory
6	Bangalore (India)	Long term basic and applied research, initially in four areas -- multilingual systems, technologies for emerging markets, geographical information systems, and sensor networks

Table 2 Research Area/Focus in every MSRC

3.2 Product Benchmark

ITB Informatics Department has 32 lecturers and also researchers in every lab with educational background as follow:

LABORATORY	EDUCATION		
	DOCTORATE	MASTERS	GRADUATES
Informatics Theory	2	3	-
Graphics & Artificial Intelligence	2	1	-
Data Base	1	4	-
Distributed System	3	1	4
RPL and Information System	3	4	-
TOTAL	11	13	5

Table 3 Informatics Department (ITB) Lecturers and fields

To assess the Indonesian IT Human Resource readiness, the research area/ topics are being compared with their correlations in education curriculums in Informatics and Computer science in State University in Indonesia (ITB and ITS) and their supporting labs. The result is shown in Table 4.

NO	AREA/RESEARCH TOPICS	SUPPORTING COURSES / RESEARCH LAB.
1	Symbolic and Algebraic Manipulation	Linier Algebra (ITS)
2	Simulation and Modeling	Modeling and Simulation (ITB)
3	Information Technology Education	Machine Learning (ITB) Software Engineering and Information system Lab. (ITB)
4	Computer Science Education	Machine Learning (ITB) Informatics Theory Lab (ITB)
5	Artificial Intelligence	Artificial Intelligent (ITB) Intelligent System (ITB)
6	Micro-architecture	Microcomputer (ITB)
7	Management Information Systems	Information System Analysis and Design (ITS) IS Strategic Planning (ITS)
8	Applied Computing	Graphics and Artificial Intelligence (ITB)
9	Design Automation	Graphics and Artificial Intelligence (ITB)
10	Genetic and Evolutionary Computation	Graphics and Artificial Intelligence (ITB)

Table 4 Connection between Area/Topics of Research with Courses and Supporting Research Lab.

In order to determine which research area /topic for the Microsoft Research Centre Indonesia there are few considerations, namely:

- Research in Microsoft Research Center worldwide
- Information Technology Research world wide from ACM
- Indonesian Human Resource Readiness (from education Informatics and Computer science curriculum in Indonesia and Supporting research labs)
- National Policy and Strategy on Research and Technology

The research area/topics above are further evaluated against the National policy and strategy regarding Science and Technology. The guidance noted that in setting priorities on Information Technology research these subjects should be followed:

1. Enhancing Indonesian human resource quality in Information Technology
2. The research products should be available as commodity
3. Applications for public services

From the guidance above, the priority for the research topics/ area are:

a. Education Supporting Research Area:

1. Information Technology Education
2. Computer Science Education

b. Commodity Research Area:

1. Micro-architecture
2. Applied Computing
3. Management Information Systems
4. Design Automation
5. Artificial Intelligence

c. Other fields of Research

1. Simulation and Modeling
2. Symbolic and Algebraic Manipulation
3. Genetic and Evolutionary Computation

Tied with area/topic of research above and further exploration throughout the research and scientific publications had been conducted by ITB and ITS researchers, then the leading products for each research area as the following Table 5:

NO	RESEARCH AREA	PRODUCT	RESEARCHER
1	**Information Technology Education**	**Information Technology E learning System** **Application for Integrating Web Base E-Learning Resource**	**ITB** **ITB**
2	**Computer Science Education**	**E learning System for Computer Science** **Intelligent Tutorial System**	**ITB** **ITB**
3	**Micro-architecture**	**Very Large System Integrated (VLSI)**	**ITB**
4	**Applied Computing**	**Search Engine** **Application Translator** Data Warehouse and OLAP	**ITB** **ITB** ITS
5	**Management Information Systems**	Enterprise Resource Planning (ERP) **IS for e-Government**	ITS **ITB**
6	**Design Automation**	**Virtual Software Developer**	**ITB**
7	**Artificial Intelligence**	**Expert System** Intelligent Information System	**ITB** ITS
8	**Simulation & Modeling**	**3D animation and Modeling Language** **Face Recognition Degenerative model**	**ITB** **ITB**
9	**Symbolic and Algebraic Manipulation**	**Cryptography Algorithm**	**ITB**
10	**Genetic & Evolutionary Computation**	Biomedical Information System **Next Generation GIS**	ITS **ITB**, ITS

Table 5 The major Research Area and Products for ITB (in Bold)

3.3 DANA Simulation

ITB holds an important role in establishment of Microsoft research center Indonesia. This has to do with the human resources or the brain capital ITB possess. This put ITB in the center piece of the actor network analysis.

The dilemma ITB faces is whether letting its top researcher go to start a research center in collaboration Microsoft or develop ITB own research base.

The Government of Indonesia supports both the Microsoft ITB collaboration and the Open-Source (also known as IGOS). This gives greater pressure for ITB. The government support for the collaboration would induce the researcher to go ahead with the research center establishment. In the other hand The Indonesian government support for open source would discourage the researcher to do so.

The support for establishing a research center would also promotes research clusters and also industrial-related clusters. This action, in the end, would benefit the establishment even further as a gesture of support for the Microsoft research Asia to establish a research center in Indonesia

Both the support from ITB and Microsoft research center Asia would result in the establishment of the Microsoft research center in Indonesia.

In the other hand development of ITB research base would benefit Indonesia in another form. This comes from of concentration of the researcher in ITB to conduct research and train Indonesians best students. This, in the end, would induce ISV to create software to enlarge the Indonesian market as Indonesian human resource developed. This could also create opportunities for creating proprietary software.

Currently the Ministry of Research and Technology of Indonesia supports the Open-Source platform more through policy and the IGOS initiative.

Though the stands for the establishment of Microsoft research Indonesia is not yet clear it is believed that it would profit Microsoft Indonesia in the long term. As of today, Microsoft Indonesia stands as the connecting bridge for ITB and Microsoft research center Asia.

All of the inputs above are interpretated into actor-network connection, the relation is drawn as Exhibit 9. After taking all input above into account, DANA simulates the model. The result is shown in Table 2

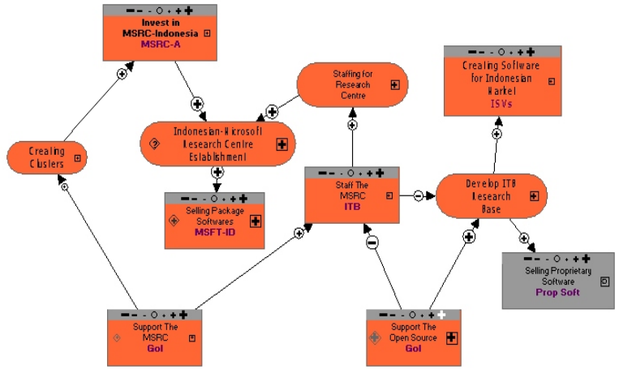

Exhibit 9 Model for DANA Analysis

The result shockingly indicates that ITB should involve in a minimum relation with the establishment of Microsoft research center Indonesia. In this case ITB researchers will not be fulltime Microsoft research center researchers. But in the other hand, Microsoft Research Center Asia, regarded the principal Microsoft presence in R&D in Asia, should actively engaged to develop Indonesian Microsoft research center.

The Indonesian government should more actively support the Indonesian Microsoft research center establishment and reduced support for the Open-Source for the time being.

	Microsoft Research Centre Establishment	
	Institut Teknologi Bandung	
Factors	Base	Ideal
Creating Software for Indonesian Market *[ISVs]*	0	1 (+11)
Invest in MSRC-Indonesia *[MSRC-A]*	0	all 12
Selling Package Softwares *[MSFT-ID]*	0	1 (+11)
Selling Proprietary Software *[Prop Soft]*	0	1 (+11)
Staff The MSRC *[ITB]*	0	all 12
Support The MSRC *[GoI]*	0	all 12
Support The Open Source *[GoI]*	0	all 12
Utility	-2.5	2.1
Satisfaction	21%	56%
Frustration	41%	12%

Table 6 DANA Simulation Results

An interesting result is found on frustration level at the very beginning of the simulation. This high frustration indicates that the current situation is ambiguous and unclear. A lot of parties are not satisfied with the current stance. If the current stance proceeds there would be hard to establish the Microsoft research center Indonesia.

3.4 Exporting Software from Indonesia

From this model the enabler for success is the infrastructure. People, technology, financing, R&D, are the major infrastructures required among other things. Indonesia has insufficient knowledge worker. Indonesia has not acquired high technology in software. Indonesia is also lack of funding for supporting software companies and R&D. This would hinder Indonesia to become software powerhouse.

Bruell (2003) uses this model to explore possibilities of exporting software from Indonesia. He found that Indonesia should develop its education and gaining international trust.

All of this becomes more apparent that ITB should be on the right track of educating Indonesian students, developing research inside the further prepared the Indonesian software-related infrastructure.

Regarding Microsoft research center Indonesia establishment, the active role should be on Microsoft's side. In the case of Microsoft research center Asia establishment, back in 1998, it is Microsoft who had the initiative. Microsoft seek the best talent, they refer as the star researchers, who are the world renowned software researchers. These talents are American educated Chinese and have superb reputation in scientific field.

After the establishment of the research center, Microsoft built cooperation with the Chinese academics and officials. This would ensure the research center development in the future. The results were remarkable. Today there are approximately 500 researchers and 300 interns in that research center.

The selection of Beijing to host the Microsoft research center facility in China was because of its proximity to China's leading universities, Tsinghua and Beijing University. This has a lot in common with the selection of ITB and ITS by the government of Indonesia to establish a Microsoft research center.

Buderi and Huang further explain that the selection of Beijing is based on the capability and characteristic of the students and researchers of those two universities. Microsoft chose Beijing because of its students ware more research oriented than their counterparts in Shanghai. This acknowledges and emphasizes the decision for ITB to develop its research capability.

Friedman (2006) states that developing countries must perform three reform, namely infrastructure, education and governance. This reform needed for the developing country to be able to play in world playing field.

For the case of Microsoft research center establishment in Indonesia, the Indonesian government as suggested above should move to support the establishment. The government should play a more active role in bringing in foreign investment especially high techs. Bridging the infrastructure gap is necessary for the government to propel the Indonesian software industry to the world level.

In the long run, Microsoft research center in Indonesia would be a great benefit for the Indonesian people. Buderi and Huang also note that until 2006 the Microsoft research center in Beijing has accepted more than 1500 interns. These interns later work or build companies in the China's high tech sector. This factor could have great contribution to put China in the second tier of the world software exporter (Heeks and Nicholson, 2002).

Further down the road, the Indonesian government should also support the education sector by creating research initiatives dedicated to the development of software engineering. This would boost ITB and other engineering universities research and development in the software engineering field.

In developing international trust, the Indonesian government should uphold the intellectual property law. In tandem with that the establishment of the Microsoft research center Indonesia would mend some of the broken image Indonesia in the international business community.

Indonesia with its fourth largest population in the world could become the world's powerhouse of knowledge based economy. It is by selecting the right field and capability to compete. The establishment

of a Microsoft research center in Indonesia could be a great opportunity to explore and to thrive in the high tech sector.

4. Conclusion and Suggestion

4.1 Conclusion of the researc

This research concluded that:

- The Indonesian ICT market is still at its infancy, it will soon growing to a promising market
- The Indonesian government has taken the first step to improve the Indonesian ICT by creating the vision for the future
- The next step taken is to create an international link and establish connection with the world ICT market. This has been done by asking Microsoft to build the Indonesian Microsoft Research Centre back in 2005.
- The Indonesian human capital is not yet sufficient for Microsoft to build the Microsoft Research Centre.
- From Microsoft Annual Report of 2005, Microsoft's Annual spending for R&D is one of the largest in the world (in terms of dollar value)
- Current Microsoft Research Centre pattern is Home Base Augmentation, or searching for talents aboard to build the home base R&D capacity. This could be seen in the Microsoft Research Centre Asia case, when Chinese-American top scientists sent back to China.
- The key lesson to build the ICT business is good business environment and good support for educating the people.
- ITB has great resources in certain fields of ICT that should be strengthened.
- There are some products and research-areas that are very potential for ITB to develop in turn would strengthen Indonesia's bidding power in the world.
- The development for Indonesian Microsoft Research Centre must be initialized by Microsoft Corporation, the same as other Microsoft Research Centre elsewhere in the world.
- ITB should strengthen Indonesian research basis by educating and spreading the technological know-how to the public.
- The Indonesian Government must support the establishment of foreign research centre, such as the Microsoft Research Centre to further enhance Indonesia's research capability along side with Indonesian universities.

Especially for ITB should:

- Retain ITB researchers especially those leading the cutting-edge researches. This would strengthen ITB competence.
- Disseminate the knowledge and technology for further development of the Indonesian ICT market.
- Promote Intellectual Property Rights, to ensure Indonesia's self appreciation of own work.
- Collaborate with Microsoft if possible to draw the best and brightest talent in the world to be able to cooperate with ITB researchers to bring ties and develop international cooperation and also to lure Indonesian long lost ICT talents to be able to return to Indonesia
- Urge the Indonesian government to develop policies that ease the ICT business and the ICT industry to gain foothold in Indonesia, especially Indonesian entreprenial-companies.

4.2 Suggestion (Roadmap)

The roadmap for establishing a Microsoft Research Centre in Indonesia is shown in Exhibit 10. The ultimate goal for Indonesian ICT development is to make Indonesia as the Software Powerhouse of the 21st Century and becoming the knowledge-based economy country. The obvious indicator is Indonesia's place as the world's top tier exporting countries.

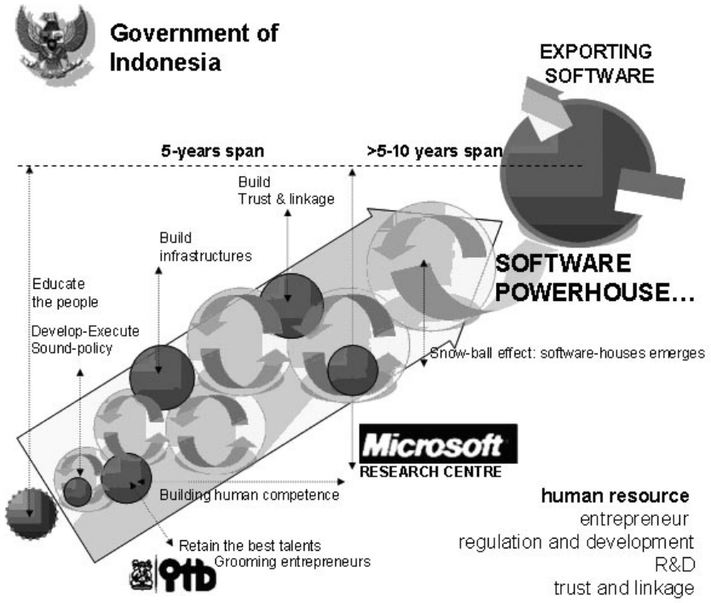

Exhibit 10 The Roadmap for Indonesia to become Software Powerhouse

To achive that goal, scholars, government officials and business people should actively involved in keeping the development on track. The actions needed to be taken for each actor in a following time series, short-term and long term is described in Table 7.

No.	Actor	Actions over Time Horizon	
		Short-term (<5years)	Long-term (> 5years)
1	ITB	Retain the best researchers	Promote Intellectual property rights
		Continually building human resource competence on ICT	Attract best / international researchers to research in ITB
		Groom entrepreneurs	Spin-off researches to build businesses
2	The Indonesian Government	Develop and execute Sound policy of ICT management and investment	Guard and maintain International trusts and linkage
		Educate the people	
		Build Infrastructures for ICT	Fasilitate Indonesian ICT business to thrive with incentives and sound policies
		Build International trust and linkage	
		Attract foreign R&D Centres	
3	Microsoft	Continually building Indonesian human resource competence on ICT	Establish Microsoft Research Centre in Indonesia
		Build strong relationships with Indonesian Government and Academics	Attract best/international researchers to research in MRC-Indonesia

Table 7 Actors and Actions over time

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