BUSINESS PROCESS REENGINEERING IN LABUAN FIRE SERVICES OPERATIONS: A CASE STUDY

Tamrin Amboala [a]♣, Minah Japang [b], Jonathon Likoh [a], Mohd Yuszreen Yusak [a]

[a]Labuan School of Informatics Science, Universiti Malaysia Sabah
[b]Labuan School of International Business and Finance, Universiti Malaysia Sabah

ABSTRACT

Most of the Business Processes Reengineering (BPR) researches carried out in private sector because of the dynamism of the business processes. Thus, this case study aim to examine the level of improvement and impact whilst taking into account factors and variables which contribute to success (failure) of business process reengineering (BPR) of e-business project in a small public organization. The project focus to describe experience learned during reengineering process of the operations function at Labuan Fire and Rescue Department (LFRD) with cooperation from Labuan School of Informatics Science (LSIS). The team have eventually proposed an actual interactive design of an e-business system called as *regional Fire Department Information System (rFDIS)* combined dual functions system: (1) inventory management system that help LFRD inventory officers up-to-date and complete data about its inventory, and (2) is a mapping system specifically for fire hydrant allocation through out the entire Labuan island that emulates the Geographic Information System (GIS).

Keywords: *Business Processes Reengineering, e-business, Geographic Information System*

♣ Corresponding author: Tamrin Amboala, Labuan School of Informatics Science, Universiti Malaysia Sabah, Labuan International Campus, E-mail: ramdzan_trn@yahoo.com

BPR in public organization

Hammer and Champy (1993) provides the prominent idea of Business Process Reengineering (BPR) which involves the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of organizations' performance such as cost, quality, service and speed. Thus, many BPR advocates the mechanism of identifying the core business process(s) before engaging all resources into the reengineering effort. The importance of the core business process(s) identification will ensure the most critical aspects that will bring the most added valued for the organizations' competitive advantage. This will ensure that the core business process is aligned with the vision and mission of the organizations. Apart from any sound methodology, results and consequence of any BPR project will determine whether the project team has selected and identifying the right core business process to be reengineered.

Most of the Business Processes Reengineering (BPR) researchs carried out in private sector because of the dynamism of the business processes. For example, the classic case study of modulations of BPR by Hammer and Champy (1993) in operational strategy of an international telecommunication company like Motorola, have indeed help Motorola decreased its total production cost by US$ 1 billion per year with more cut time by half in production cycle time. Thus the reengineering processes in the company manufacturing operation have gone through dynamic upgrading on its manufacturing equipment such as reinvented tooling processes and parts redesigned. However researchers like Hesson, Al-Ameed and Samaka (2007) carried out a case study on BPR attempt on e-governemnt project in United Arab Emerites (UAE) public administration organization by adaptation of Gunasekaran *et al.* (2000) five-point incremental approach have came to the conclusion that like other private business entities, public organization also seems to be sensibled to carried out BPR in its services delivery and administration processes. Thus they introduced the term called business-to-administration and consumer-to-administration terminology in BPR activities that involve public administration. In brieft the researchers outlined these three different types of driver for BPR in the public organization: 1] new legislation; 2] new (or improved) services; and 3] new technology. Nevertheless, as for this case study, the team look forward for technology advancement and improving LFRD delivery system in its proposed BPR activities.

Organizational Background and Operation

Labuan Fire and Rescue Department (LFRD) consists of 3 stations namely Balai Bomba Tun Mustapha, Balai Bomba Layang-layang and Balai Bomba Kampung Jawa. There are totally over thousand units of inventory that stored in the warehouse of fire department and it was classify into 3 main categories which was operation inventory, communication inventory and office inventory. Operation inventory consists of EMS, HAZMAT, rescue tools, scuba , fire extinguisher, fire engine, fire truck , while communication tools consist of fixed repeater, mobile repeater, radio mask and walky talky. Finally the office inventory have been classified as landscape tools and also office tools.

Based on the field observation, LFRD does not have a systematics inventory management system in place as huge amount of inventories have been recorede manually and inventory data stored into department's logbook. Additionally, LFRD also

does not have a standardized policy or rule to record the inventory data, which then vulnerably main cause of missing data or data duplication. This manual system was not systematically manageable and error are occurs frequently.

Thus, LFRD need an electronic based inventory management system (e-inventory management system) to manage its inventories as well as effective tools for monitoring its valuable inventory records from losses due to spoilage, pilferage and obsolescence. The propose e-based inventory system help LFRD store operation officer to minimize total inventory cost while increasing the efficiency of order policy.

Propose Reengineering Processes for LFRD

The basic idea of proposed e-inventory system for LFRD is based on e-business fundamental process of information and infranstructure. Since the advent of Internet and its online databases capabilities have change the way people carry out their tasks in an organization. The past decade has seen the rapid development of electronic business with the emergence of information system applications. Eventhough e-business relatively seen as a new term of the way organizations carried out its routine, the integartion using internet linkages between people and work processes associated with it may bring forward valuable assets and cost reduction strategy in public services organization like LFRD. For instance, a study by O'Neill and Sohal (1998) on BPR attempted within Australian private and public organizations found that it is alarming that almost one-fifth of Australian respondents see modulation of information technology like e-business tool in business processes play the major driver in their strategy of customer service and cost reduction, but in doing so may be automating processes without the true benefit of reengineering. Nevertheless, Robbins (2006) conclude that e-business is the way an organizations does its work by using electronic means (Internet-based) linkages with its key constituencies in order to efficiently achieve its goal.

In order to get the basic idea on e-business process in BPR, LFRD officers and staff are require to understand some particular set of work activities and the related resources to be organized, streamlined and structured as an e-business takes advantage the internet and information system capabilities to produce a deliverables with increasing speed of activity, human error reduction, cost reduction or avoidance. By understanding the capabilities of e-business concept and its application system, the team initiated and embarked on BPR project of digitizing its operational functions specifically for the actual LFRD's inventory management system.

This proposed e-business project for LFRD namely *regional Fire Department Information System (rFDIS)* based on the work of Davenport *et al* (1995) in adaptation of Hammer and Champy (1993) BPR point of view. There are four steps in reengineering e-business process into LFRD;

1. establishment of the business process objectives,
2. identification of process to be redesigned,
3. analyzing and modeling the current and planned processes and;
4. design and build a prototype of the process.

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The best possible solution for more efficient processing and workflow path were achieved. Great time and human resources were achieved but reduction of cost and financial saving was less significant. The analysis from this case study served as a valuable input of understanding BPR works in Malaysian public organization. The system would benefit the users in which time consuming for LFRD's operations officer to locate its inventories from the logbook. The system able to generate automatic reports according to the requirement of LRFD inventory controller which will offer a reduction in costs required to complete previous traditional inventory allocation procedures. Many of those same traditional inventory allocation approaches can be eliminated and replaced with electronic means, which are often easier to carry out as well as easier on the fingertips.

Additionaly, *regional Fire Department Information System (rFDIS)* designed to be a highly interactive dual functions system 1] is for inventory management system that help LFRD inventory officers up-to-date and complete data about its inventory. 2] is a mapping system specifically for fire hydrant allocation through out the entire Labuan island that emulates the Geographic Information System (GIS).

The interactive e-inventory system also make available for the fire department to holding the accurate number of inventory without surplus or deficit. Thus, fire department inventory management system will bring continuity and smoothness work flows to LFRD despite from expedite the business process. As for the proposed mapping system within *rFDIS* have provides a great challenge tasks for the project team members to grid approximately 100 x 100 km² land that consists of icons of fire hydrant at every specific location whilst integrating every single fire hydrant with information stored at *rFDIS* data base.

Objectives

The research and system development team tries to embark on the following objectives:
- To automate the inventory process management at Operation unit
- Change the Information Flows around the Process of the fire services
- To make the information more easily accessible upstream and downstream

The business process at LFRD must be redesigned by modifying the information flows around it so that information can be captured as early as possible an in a digital form. This eases information propagation throughout the process, eliminating human effort and errors, plus it will shrink process cycle time. This will give a better advantage of the information if decision need to be made throughout the process. As in the case of Inventory Management System at the Operation Unit, the data captured at source is *digitized* as early as possible.

The project team intends to make the entire process as *paperless as possible*. Even monthly report by the operation unit which summarizes the entire operation unit activities including the inventory update can be generated and submitted to the headquarters at Putra Jaya in a Portable Document Format (PDF), in a Hypertext Markup Language (HTML) and in a text document format. Anyway due to operational infeasibility this functionality will only complement the paper based report. The standard operating procedure prevents us to fully adopt this redesigning tactics.

Another approach to informate the business process require the new system to be accessible upstream and downstream. When information is in a digital form, it can be easily being made available to those who need it throughout the business process (El-Sawy, 2001).
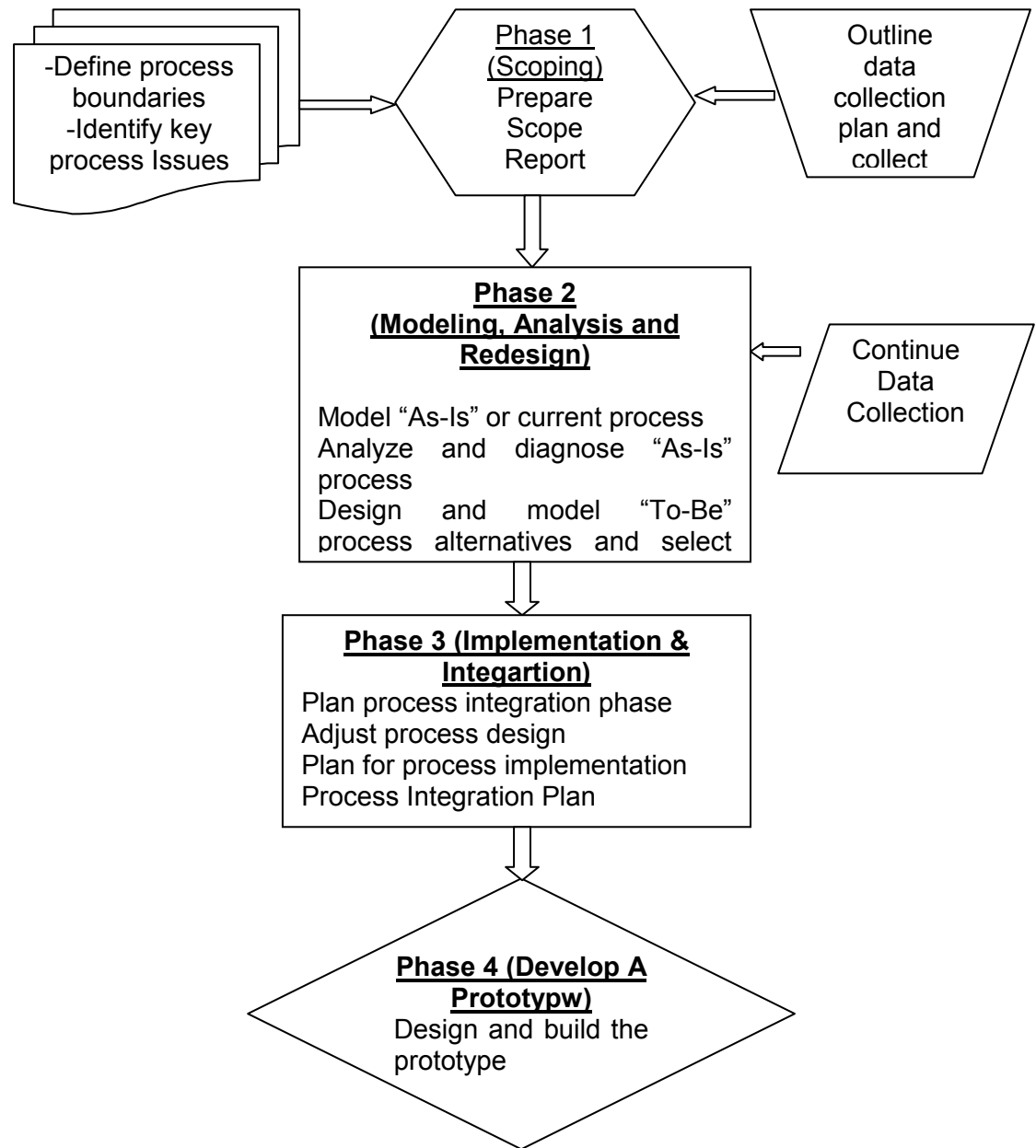
Thus, as to ensure the stability and validity of the rFDIS system, the team studied the almost similar e-inventory management system implemented in Wal-Mart; a giant retailer as the best example that benefited from this approach. The suppliers know when to replenish the inventory without Wal-Mart has to prompt it. Information for sales figures and inventory levels are automatically displayed in real time as customers purchase the sales items. LFRD system enable the headquarters access the inventory level without require the monthly report to be submitted at the end of month.

As El-Sawy (2001) proposes that to enable much faster decision making the business process reengineering shall look into ways to shrink the distance between the Information and the decision making processes. According to our interview with one of the officers they have problems in managing inventories are quite crucial and tedious as the report need to be updated manually. Not just the quantity, the condition of the every single equipments, expiry dates and etc. must also be recorded. Fail to do so might result casualties during emergency. What is commonly practiced here every LFRD will only order and receive any equipments and materials without ensuring the necessarily and availability of those things from the headquarters. The headquarters also have no way to track and receive updated inventory from every fire department throughout Malaysia electronically other than what has been supplied by mail of faxed monthly. This will lead to cumbersome, wasteful and inefficient decision making when it comes to supplying the accurate quantities of equipment.

As LFRD is also given an amount of money based on the annual budget in order for them manage and obtain supplies from local suppliers and contractors sometimes the allocation will be diverted to maintenance and repairing purpose at the end of the financial year.

Description of Methodology

After the project definition has been articulated the following processes flow phases and steps:

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┌─────────────────┐        ╱ Phase 1  ╲        ╱ Outline  ╲
│ -Define process │       ╱  (Scoping)  ╲      │   data     │
│   boundaries    │  ═══▷ │   Prepare    │ ◁══ │ collection │
│  -Identify key  │       ╲   Scope     ╱      │  plan and  │
│ process Issues  │        ╲  Report   ╱        ╲  collect  ╱
└─────────────────┘             │
                                ▽
┌──────────────────────────────────────┐
│            **Phase 2**                │        ╱ Continue ╲
│  **(Modeling, Analysis and**          │       │   Data     │
│        **Redesign)**                  │ ◁═══  │ Collection │
│                                       │        ╲          ╱
│ Model "As-Is" or current process      │
│ Analyze  and  diagnose  "As-Is"       │
│ process                               │
│ Design   and   model   "To-Be"        │
│ process  alternatives  and  select    │
└──────────────────────────────────────┘
                    │
                    ▽
┌──────────────────────────────────────┐
│  **Phase 3 (Implementation &**        │
│       **Integartion)**                │
│ Plan process integration phase        │
│ Adjust process design                 │
│ Plan for process implementation       │
│ Process Integration Plan              │
└──────────────────────────────────────┘
                    │
                    ▽
              ╱           ╲
             ╱  **Phase 4 (Develop A** ╲
            │      **Prototypw)**       │
            │   Design and build the    │
             ╲    prototype            ╱
              ╲                       ╱
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Project Execution and Implementation

The project team started digitizing business processes in LFRD by developed *regional Fire Department Information System (rFDIS)* which consists of two major component with e-inventory management system and fire hydrant allocation mapping system to maintain systematic management process. This system benefits the users in which time consuming for them to locate the inventory from the logbook has been eliminated. Report are generated automatically according to the requirement of fire department to reduce the burden of the users.
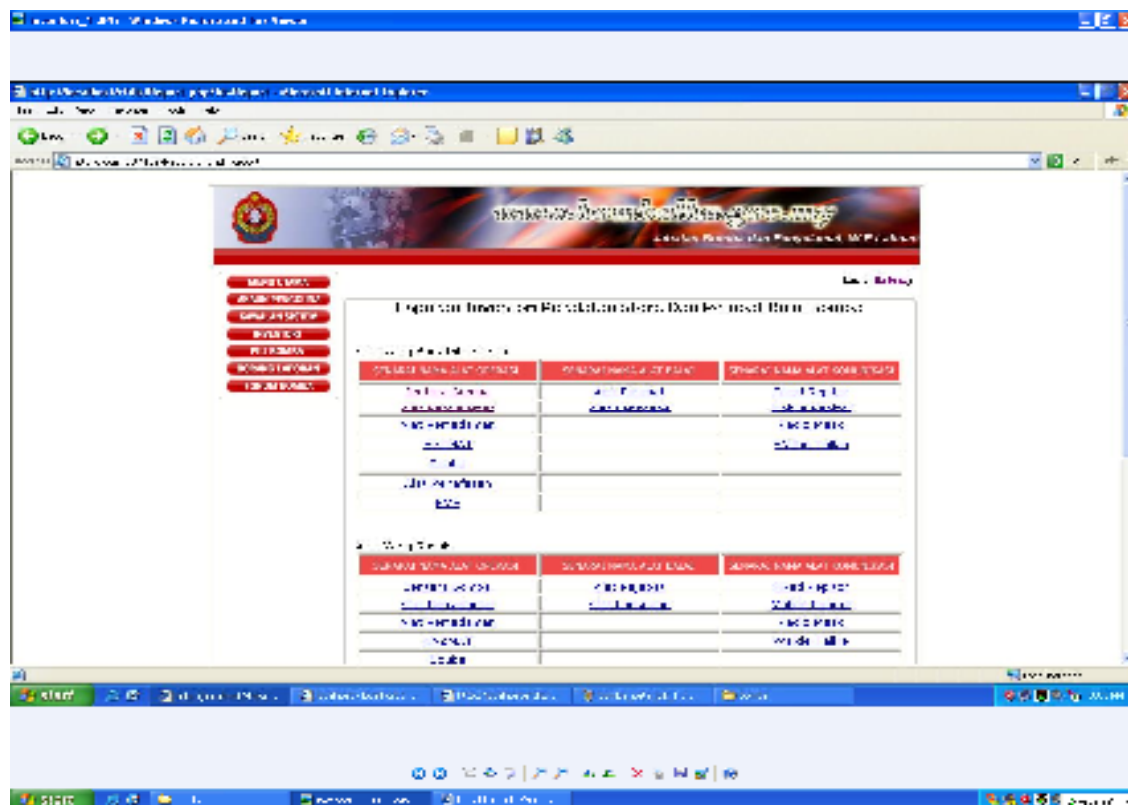
Figure 1: rFDIS-inventory report

Figure 1 show the interface of *rFDIS* inventory report whereby every unit is required to submit monthly (routine) report to the headquarters at Putra Jaya. The above information is extracted from the database printed before submission.

Previously all reports are filled up manually. The task is cumbersome and tedious which prone to human error. With the new *rFDIS* all these processes are carried out automatically aided with the bar code technology.

Figure 2: List of LFRD's inventories

The project team intended to make the entire process as *paperless as possible*. Along with the monthly report by the operation unit which summarizes the entire operation unit activities including the inventory updates can be generated and submitted to the headquarters at Putra Jaya in a Portable Document Format (PDF), Hypertext Markup Language (HTML) and in a text document format. Thus, Figure 2 provide LFRD inventory officer list of the LFRD's inventory with each tools unique serial numbers, price, status and labels.

Another module of Fire Hydrant Mapping and Management is also designed. In addition, the mapping system function enable the officers to update and record data in mobile while carrying out routine on non-routine inspection of any fire hydrant at any location spontaneously on the fly with their lap top computers. The mobile feature of the rFDIS is much more convenient compared with the legacy systems where inspection and record key-in are carried out at different locations (site and headquarters) at different time.
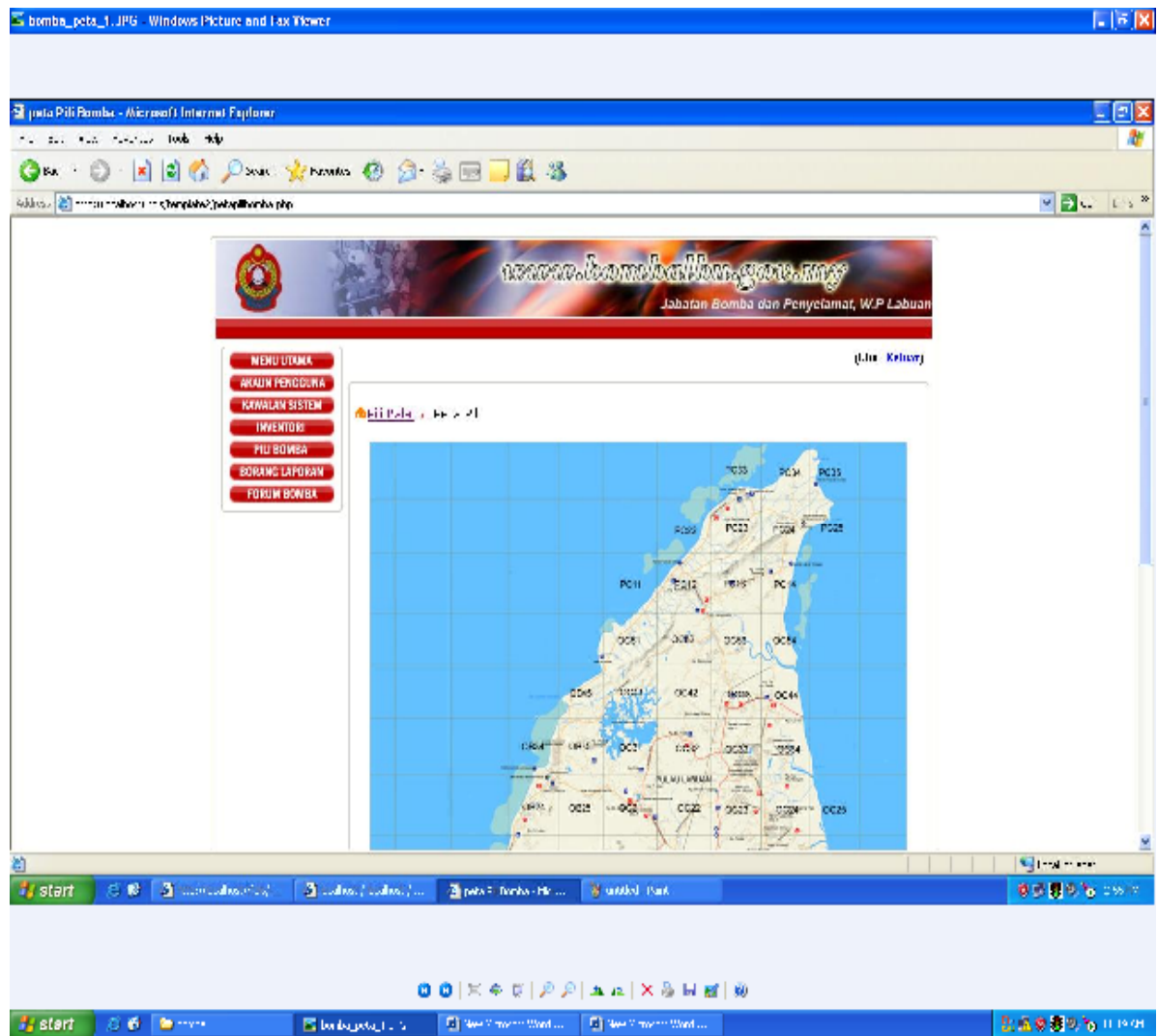
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Figure 3: Fire Hydrant Mapping Component of rFDIS

Figure 3 show the feature of Fire Hydrant Mapping and Management by locations. The officers will only need to point to the location in the system and automatically linked to the specific fire hydrant. Then fire hydrant data such as its water pressure, condition and maintenance status can be updated directly into the *rFDIS* database.
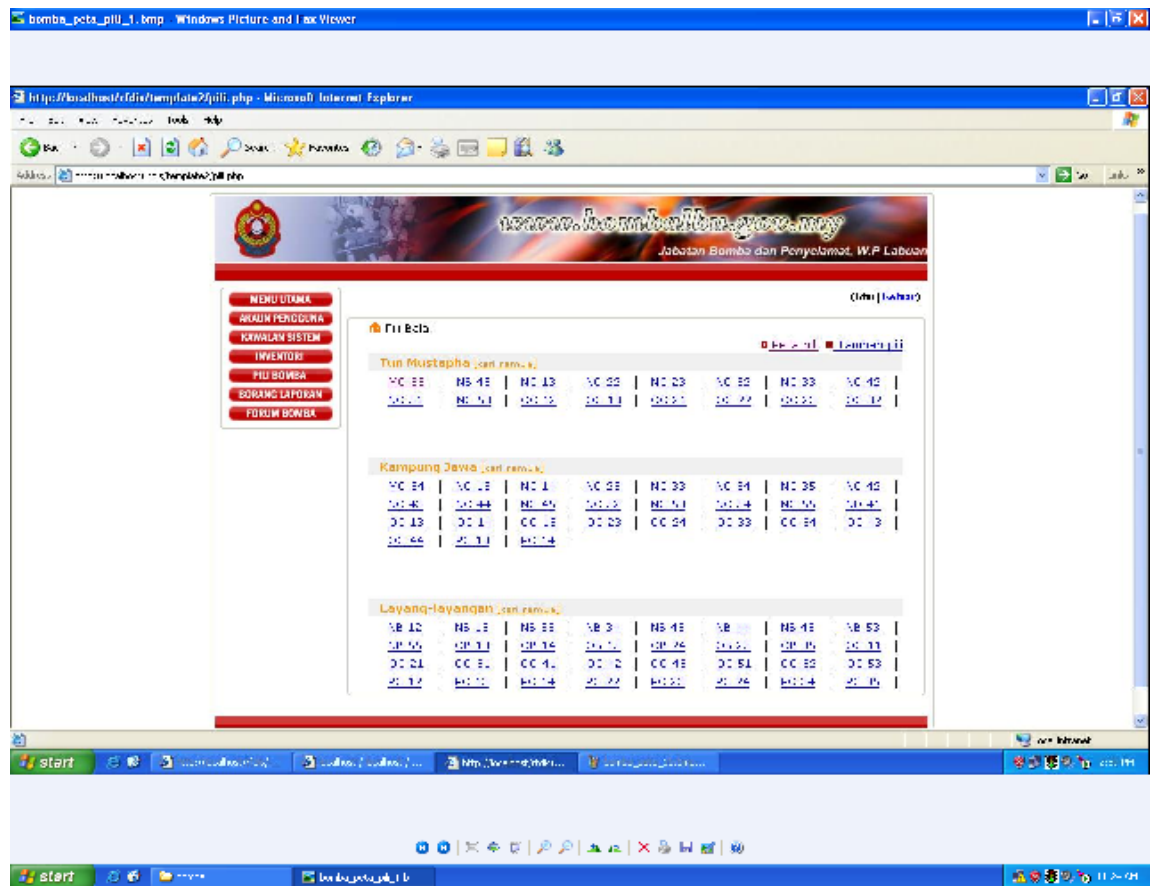
Figure 4: Fire Hydrant Mapping List By Locations

Figure 4 show all fire hydrants throughout Labuan island have been codified with unique serial numbers which contained all the associated information including its location. The personnel will only click the specific fire hydrant or location which enable them to access or updated new information. If a new fire hydrant is installed, the specific code and all the related information can simply be added easily.

Results and Discussions

After a year of rigorous analysis and implementation the prototype system of *rFDIS* managed to be deployed and presented before the officers of Labuan Fire and Rescue Department. The *rFDIS* consists of two main modules which are the Fire Hydrant Mapping and Management and Inventory Management and Report that constitute two core routine businesses of the Operation Unit of the fire services. The project team members were applauded with their impressive *rFDIS* project.

Although the project has been successfully deployed, the organization is considered failed to achieve tremendous impact of the business reengineering project. No significant improvements in terms of business transformation after the system deployment. As LFRD is a public entity with small scale and limited impact of this project is understood. As public entity many important elements of BPR such as changes in organizational structure and empowerment are difficult to be implemented due to bureaucratic constraints.

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The above notion is consistent with the research findings and experienced learnt from Kock (1996). As other organizations are pressured to operate under low cost that require them to reduce cost of operation, increase productivity and emphasize value-added productivity in order to gain competitive advantage, public sectors are less enthusiastic towards that goals. The notion has also strengthened the assumption that it will not be possible unless radical changes in the bureaucratic practices made which will lead to deregulation. It might be even worse if LFRD has to manage both the *rFDIS* and their legacy system in order to abide with the Standard Operating Procedure (SOP) requirement manually. In order to maintain the dualism will not only add another redundancy but will also double their workloads and cost instead of decrementing it.

Another finding by Thong, Yap and Seah (2000) in understanding how BPR may be given different impact in public organizations have came to the conclusion that their case analysis showed there are similarities in the BPR experiences of public and private organizations, there are also notable differences. In this specific case, there were social and political pressures to reengineer, press publicity to promote BPR, a reengineering team comprised mainly of neutral staff, performance benchmarks adapted from the private sector, high-level approval for redesigned processes, and a pilot site implementation to secure further funding. It concludes with lessons learned for implementing BPR in public organizations. Whilst the case study on e-government reengineering by Hesson, Al-Ameed and Samaka (2007) found that the most serious obstacles of implementing the electronic version of BPR applications' processes in the land department of Al-Ain Municipality was the reluctance of some key decision makers to cease or reduce some of their authorities. Those officers believe that a direct supervision or control on the different stages of the processes is essential. Therefore, their finding suggested a special considerations may be required under certain circumstances and these are only dealt with by key decision makers, especially when came to the issues of implementing BPR in public organization.

Thus, in this case study the team indeed found that due to bureaucratic constraints the project team was absence and not consulted to determine which are the core business process that are essential than the others. This require high level decision making and the project team is not in the position to participate. This is the main and common issues that arose and surrounded many of reengineering effort in the public sector that led to perception of the feasibility of reengineering effort in public sectors (Kock., McQueen & Baker, 1996)

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