A Development of Order Processing System: BPMN Model

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Abstract— **Business process plays an essential role in business enterprises. Nowadays, those enterprises face many problems caused by business process and lead to inefficiency in organization. As the technology has been growing, it widely adopted to solve such problems. This dissertation studies the case of customer order process of Thai Orchids Company (TOC), the leading company in exporting fresh-cut orchids to customers worldwide with a number of orders every day**

TOC mainly operates the business manually and paper intensive which lead to complexity and time-consuming, ineffectiveness in process. Based on the literature review, business process management (BPM) has been studied and widely adopted to solve the mentioned problems. BizAgi Suite, a business process management system (BPMS) which supports the full business life-cycle and also provides business process modeler tool, is used as a tool to implement the system. With this system, problems are solved and challenges are archived.

Keyword – **Business Process Management (BPM), Business Process Modeling Notation (BPMN), business process modeling, customer order processing system, Thai Orchids Company (TOC)**

I. INTRODUCTION

Information systems (IS) fail many times to meet the requirements of their users. Various empirical researches indicate that there is a positive correlation between process management and business success. Organizations are increasingly interested in understanding, managing and improving their process portfolio. If an organization can quickly respond to a demand for a higher level of service from their customers by improving performance of key business processes, this organization is considered to be close to success. Therefore, the improvement of corporate processes has consistently been identified as a top priority. The collection of tools and methods to achieve these objectives are referred to as Business Process Management (BPM).

This dissertation primarily studies the case of customer order process of Thai Orchids Company (TOC), the leading fresh-cut orchids exporter, which mainly operate manually and paper-intensive activities. The new BPMN-based process model is designed and then the BPM-based customer order processing system is implemented. BizAgi Suite is used as a tool to implement the system.

According to the approach discussed above, we have created outline for this dissertation by providing the related concepts: BPM, BPMN, Business process modelling and BizAgi Suite introduction. Then, introduce TOC case study about customer order process on its problem and how to solve each problem using the selected business process. Finally, we concluded the results, discussed and pointed out the limitation and future study on it.

II. PRELIMINARY CONCEPTS

A. Business Process Management (BPM)

Business process is defined as the combination of workflow and EAI processes covering all types of processes that span people as well as applications. It is a sequence of tasks that are conducted in series or in parallel by two or more individuals or applications to reach a common goal.

Business Process Management (BPM) is the discipline of modelling, automating, managing and optimizing business process throughout their lifecycle to increase profitability. BPM, featured with efficiency, effectiveness, and agility, has become a top priority for companies in recent years and most companies.

1) Efficiency: It is typical for a company to first see efficiency benefits when deploying BPM. Most processes have significant waste because of manual effort, poor hand-offs between departments and a general inability to monitor overall progress. The initial deployment of a BPM solution eliminates these problems – and the benefit is typically expressed in full-time equivalent time saved.

2) ***Effectiveness:*** Once a company has realized the basic efficiencies that a more controlled process brings, they will often focus on making the process more effective. These are where some of the largest gains are realized. The returns here are typically expressed in the context of handling exceptions better or making better decisions. In some cases, this benefit can be monetized (e.g., reduction in fines), but often this compliance benefit is viewed as critical even if a financial benefit cannot be directly associated with it.

3) ***Agility:*** The final key benefit BPM provides is agility. In the era of the Service Oriented Architecture (SOA) and On-Demand, agility is a well-understood concept. In the world of Process Management, the ability to change quickly is essential.

BPM provides the platform you need to be able to change your processes – faster and in a more controlled fashion than any other option. Agility benefits typically include supporting federal regulations faster – eliminating chances of fines or delays in approval.

- Business process lifecycle **:** The lifecycle of a typical business process is illustrated in figure 1

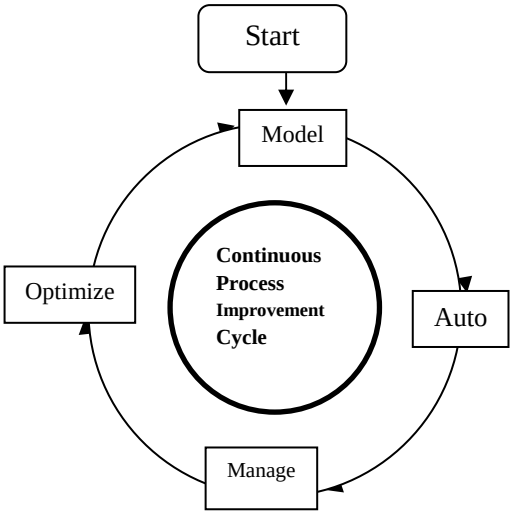

Figure 1. Business process lifecycle

The various stages of the lifecycle are as follows: modelling, automation, management and optimization. The last stage is not the end of the life of the business process. As depicted in Figure 1, after the process is optimized it goes through the same steps again in the cycle of continuous improvements. BPM is different from workflow. Figure 1 shows the relationship between workflow management and business process management. This life cycle describes the various phases in support of operational business processes.

BPM enables business to respond to changing consumer, market, and regulatory demands faster than competitors - creating competitive advantage. this brings with it the benefit of being able to simulate changes to your business process based on real life data (not assumed knowledge) and also the coupling of BPM to industry methodologies allow the users to continually streamline and optimize the process to ensure it is tuned to its market need.

B. Business process modelling

Business process, as expressive and as communicative as is the technique that has been used to model it, is the chain of operations whose final aim is the production of a specific output for a particular customer or market. Business process modelling (BPM) plays a major role in the perception and understanding of business processes. Therefore, the elements and the capabilities of a business process model are significant in describing and understanding a business process.

The main process modelling techniques and classifies them based on two dimensions: firstly, concerning with four different purposes of use and classifying the business process models based on whether they are, and secondly, distinguishing between active and passive models.

C. Business Process Modelling Notation (BPMN)

The Business Process Modelling Notation (BPMN) provides a notation that is readily understandable by all business users including the business analysts that identifies and verifies the minimal errors occurring during product implementation to both technical users and business users. The BPMN specification also provides a mapping between the graphics of the notation to the underlying constructs of execution languages, particularly Business Process Execution Language.

D. Business Process Management System (BPMS)

Business Process Management System (BPMS) is capable of executing application-to-application and person-to-application processes. Implementation of BPMS technology reduces time-to-market for changes in business processes. With the help of BPMS implementation, changes in business process are addressed with minimal IT efforts, resulting in faster time-to-market and business process change. BPMS also measures and stores the process execution data, which can be used later for creating business operation monitor (BAM) reports.

Because the process definition is available in pictorial form, it is convenient to share across the organization and it is easy to understand and helps reduce the gap that typically exists between the business and IT teams.

- BPM solution architecture, a classic, three-tier architecture that separates the information consisting of the business process defining database, the logic consisting of business definition interpreting BPM server and the presentation or user interface into each separate layer enabling users to interact with BPM system.

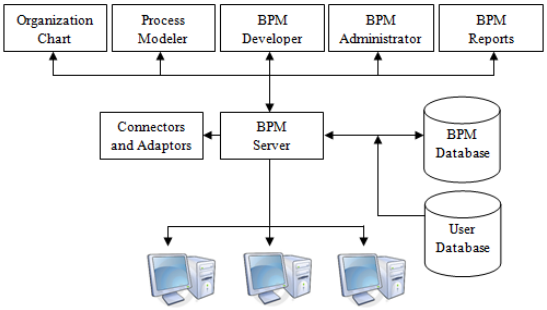

Figure 2. BPM solution architecture

A business process has a lifecycle during which many different categories of individuals interact with the process. These individuals have different skill sets, and therefore require different software tools that a BPM system must provide in order to scale for enterprise-wide use.

E. Introduction to BizAgi

BizAgi, a leading BPM Solution that will enable you and your organization to model, automate, execute and improve

your business processes through a graphic environment and without the need of programming, has a concept about generating automatically a web application, which is based and activated by a process diagram without requiring any programming, which means, “the process is the application” with complete life cycle of a business process: Model, Automate, Execute, and Improve.

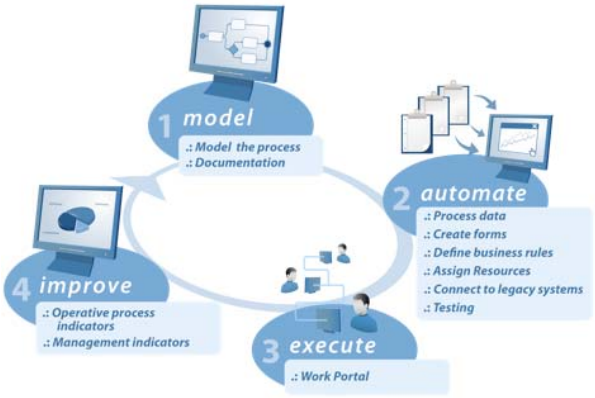

Figure 3. Complete lifecycle of a business process in BizAgi

For its technical architecture, BizAgi has four fundamental layers for its operation:

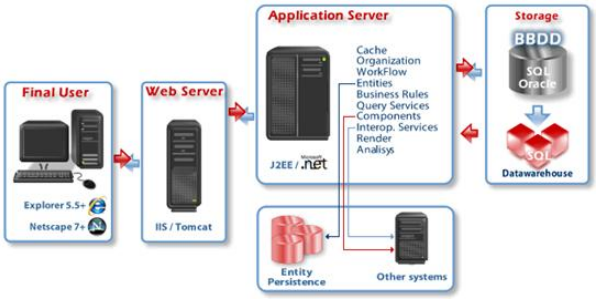

Figure 4. BizAgi technical architecture

III.TOC CASE STUDY

TOC, Thai leading fresh orchids cut- flowers exporters, is our case study objective in this paper. TOC customer order process, as well as the problems, challenges and solution will be concerned in next sections.

A. Introduction to TOC and actual customer order process

Thai Orchids Co., Ltd. (TOC) was established and located in Bangkok, Thailand in 1989 fully engaged in exportation of fresh orchid cut - flowers. In the beginning the company possessed only 5-6 overseas clients. TOC was accredited ISO 9001:2001 in 2001 with entirely focus in quality management system, good ethnical initiative as well as fairness treatment to their employees.

With the experience and continual development over 20 years under the guiding principle “Thai Orchids Step Forward Worldwide,” TOC now has more than 30 overseas clients.

Due to the increased number of clients, TOC Farm (TOC Nursery) was initiated to supply TOC’s customer orders directly. TOC Farm, located in Ratchaburi Province where is suitable for orchids growing, is separated into eight regions according to orchids’ species and administrated by the supervisors and skillful farmers to guarantee the quality of orchids as shown in figure 5.

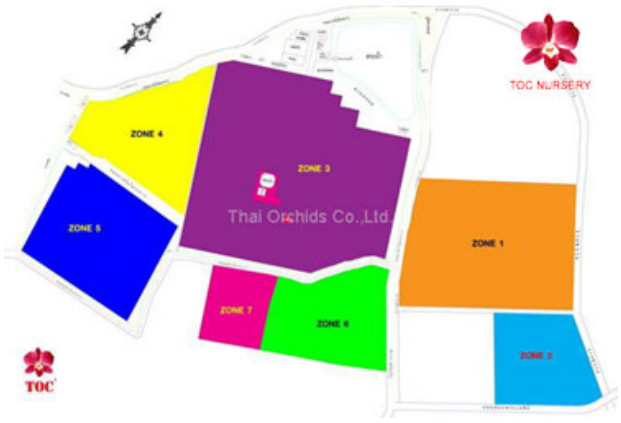

Figure 5. TOC Farm

TOC receives over 50 orders approximately a day (over 500 breeds of orchids per order) from clients worldwide via phone calls, faxes, emails. TOC handle with those incoming orders with many steps.

All steps from the beginning (placing order by customer) to the end (shipment delivered to customer). Some of the steps are operated by experienced staff in the production lines, farmers, etc. Some are in the office such as sale department, exporting department, and purchasing department. According to the actual situation and our intension, we mainly focus our study on operations in office in order to automate, simplify those operations from IT perspective.

B. Customer order process of TOC (case study)

As mentioned above, certain operations from the actual customer order process are studied. The operation is that, the customer places an order to Sale via fax or email in their own preferred. Sale Dept. acknowledges the order, customize to the official format, make two copies, and send the orders to Exporting Dept. and Purchasing Dept. on foot. Subsequently, Exporting Dept. makes a phone call to agency check whether the flight is available. If the preferred flight is available, the Export Dept. will make another call to Sale Dept. to inform of the flight information. If the flight is unavailable, Sale Dept. will be informed with the new possible flight. Then, Sale Dept. will contact customer via phone call, fax and email to get the response as soon as possible. Customer decides whether accept new possible flight or not, if yes, the flight process is done by response to Sale Dept, if not, the customer will request for order cancellation.

At the same time as flight inquiry, Purchasing Dept. is checking for the orchid’s availability. Firstly, the amount of orchids to order will be calculated first in record book. Then, make a phone call to TOC Farm to ask for availability of

orchids needed. If TOC cannot fulfill all requested orchids, Purchasing Dept. will make phone calls to other farms for the bargained shortage. Once all requested orchids are fulfilled, the Purchasing Dept. will make an internal call to get the order approval. After the order is approved by Sale Dept., then the status of order will be informed to customer over the phone call.

1) ***Problems and challenges:*** From the customer order process of TOC in figure 5, we summarize the problems found and collected from TOC people in following tables. Challenges are also presented in the table.

TABLE 1. SUMMARY OF PROBLEMS AND CHALLENGES OF CUSTOMER ORDER PROCESS OF TOC FOR CUSTOMER

Problems	Challenges
- Do not know the current status of order - Communicate over phones and faxes - No format for placing order	- Reduce the cost to order - Systemize the order placement - Reduce the time spent - Monitor the status of order

TABLE 2. TABLE 2: SUMMARY OF PROBLEMS AND CHALLENGES OF CUSTOMER ORDER PROCESS OF TOC FOR TOC PEOPLE

Problems	Challenges
- Take time and difficult to handle with various formats of orders - Do not know which operation is conducted - Paper-based process and perform manually - Cannot produce reports - Too complicate to handle with suppliers - Unclear process	- Reduce operating cost - Reduce the time spent - Monitor the status - Reduce the workload - Automate - Reduce the repeated operations - Reduce redundant information - Provide report generation - Provide operation paths

TABLE 3. TABLE 3: SUMMARY OF PROBLEMS AND CHALLENGES OF CUSTOMER ORDER PROCESS OF TOC FOR IT DEVELOPERS

Problems	Challenges
- Do not fully understand when discussing with executives - Encounter difficulties when customizing the system - Time-consuming with coding - Difficult to maintain the system when the process changed	- Reduce time-consuming in coding - Provide the standard representation of business process - Support full life-cycle of business process

2) Solution: The problems and challenges presented in previous section, we consider BPM as a tool to solve such problems and archive such challenges with its benefits introduced in chapter 2. To archive those goals, we firstly design the new standard process, BPMN, to make the better process and eliminate weaknesses; this new process will be used to implement the system. Once the BPMN model-based process is done, we implement the BPM-based customer order processing system.

The BPM solution we use in this study is BizAgi Suite comprise of BizAgi Process Modeller and BizAgi Xpress with its good features and benefits discussed in Chapter 2.

IV. BPMN MODEL-BASED CUSTOMER ORDER PROCESS DESIGN

To solve the problems mentioned in last chapter, we redesign the system based on BPMN model based process, which takes edge of BPM features. Subprocesses and processes showing message flows are provided as well. The tool used to design the new process is BizAgi Process Modeler.

A. Overall Process

The process starts when the customer place order (Subprocess) via the system and then the order is acknowledged (Script Task) by Sales Dept. The system will automatically forward the order to Exporting Dept. to check the flight availability (Manual Task) and to Purchasing Dept. to check orchids availability with TOC Farm (Subprocess) simultaneously.

Once the flight fulfillment and orchids fulfillment are activated, the Sale Dept. will approve the customer order (Script Task) and inform the order approval (Send Task) to customer. The customer will finally be informed the order approval (Receive Task).

B. Subprocesses and processes showing message flows

After the overall process is designed, we need to give more detail on collapsed operations that have their own processes inside, called subprocess. And as of the customer order process, many participants play important roles and participate together, the message flows are also designed to show how they communicate from separate pools as shown in following figures.

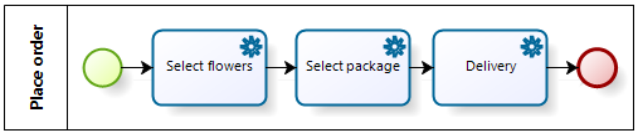

Figure 6. 'Place order' subprocess

There are three operations for the customer to place the customer order. First, select orchids type and size (Service Task), and then select package (Service Type). Finally, provide delivery information (Service Type).

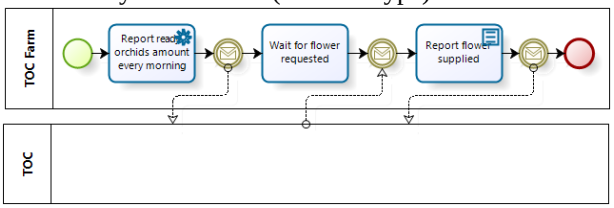

Figure 7. Check orchids availability' subprocess showing message flows in TOC Farm pool

Every morning, the TOC Farm reports the ready orchids to TOC (Service Task) as message to the company, and then when the orchids is requested from the company that means the message of requested orchids information comes. Finally, TOC Farm will report the orchids that can be supplied (Script Task) back to the company (sending the message).

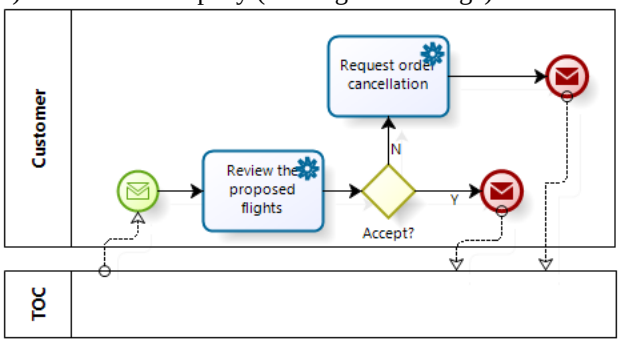

Figure 8. Message flows in customer pool when the new possible flight proposed

The customer gets the message of new possible flight from the company. After the customer consider the flight proposed, the message of acceptance or cancellation request will send back to company.

The new possible flight is the message sent to the customer and the acceptance is the message sent back to Exporting Dept. If the customer does not send back the response within 1 day, the reminder (Script Task) will be send to the customer.

V. BPM-BASED CUSTOMER ORDER PROCESSING SYSTEM IMPLEMENTATION

This chapter presents steps of implementing the BPM based customer order processing system following the process designed earlier. The tool used to implement this system is BizAgi Xpress. The BPMN model based customer order process, which was done and presented in chapter 4, is automatically executed for the next steps. Data model (data structure) contains the information required from each operation in the customer order process including subprocesses.

There are 3 entity types in the model defined: Master entity, System entity and Parametric entity.

TABLE 4. THE ATTRIBUTE LIST FOR 'CUSTOMERORDERPROCESS' ENTITY

Attributes	Type
FlightSchedule	Collection (Flight)
FlightAvailable	Boolean
CustomerOrderApproval	Boolean
CustomerOrder	Master (CustomerOrder)
CustomerOrderAcceptance	Master (CustomerOrderAcceptance)
CustomerOrderApprovalComment	String
CheckingFlightComment	String

The above table is the example table of 'CustomerOrderProcess', showing the featured data in an attribute for one entity. This attribute style is used similarly in every entity in database.

A. *Define forms*

Once the data structure is defined, now we define the forms to create the user interface required by the process. This step is done by the feature BizAgi Form Modeler in BizAgi Xpress. Some example screenshots of user interface are shown in following figures.

Figure 9. Screenshot of defining user interface (place order)

Once the forms have been defined, next step is to create the business rules to control the process rule. Consequently, it is the step of defining process participants (performers) for this customer order process**.**

Finally, it is the step of execution. This step is to run the web application based on what we have defined earlier, process model, data model, user interfaces (forms), business rules, and performers.

B. *Result*

This chapter shows the result from this study, how the BPM-based customer order processing system archive, and how the problems are solved.

With the new system that user can monitor every business process, it leads to accuracy and trustfulness in business, which means, the new process can save up the money spent on sending fax, save up the time spent to create order. Since everything is on system and online, it is faster, more flexible and accurate to perform business process. Additionally, the faster and accurate system is, the more impressive the customers become.

VI. CONCLUSIONS

A. *Conclusion and discussion*

BPM is the best investment a company can make in establishing a platform for continuous improvement. In this case study, our study is conducted in the practical situation of TOC. From the running process and the results, we can see great advantages of this system. This work can be the prototype for company whose engage with agriculture, flowers, farm, etc. This new system can provide customers a

platform for information management which is much better than the traditional way. Customers are able to not only know the status of order, but also be informed immediately when there is something wrong happens. At the same time, this system can generate report automatically to the executives for decision making or future improvement. The holder of the company has no need to worry about the quick replacement by other new technology in business process. It is easy to optimize BPMS, which is figured clearly out in the BPM life cycle.

However, BizAgi has some tiny defects. The customization allowed by BizAgi is limited. As because BizAgi is codeless, we can just design within the bounds of what BizAgi provides. What more, we cannot automate the operation of checking flight availability due to unavailability of flight booking agencies in information system. Despite of these defects, BizAgi is still an ideal system for business process management.

B. Limitations and future study

This study is conducted on the case of TOC. One limitation is that our study objective is just focused on the perspective of customer order. It is a limited part of all company operations. We suggest the future work could expand the system to cover the whole business processes in the company. For example, supply management system is a new field to have BPM trial-run.

Another limitation comes from the personnel of the company. As most of the staffs are less educated, they cannot well operate the system, which leads to incompletely display of the advantages from this system. We suggest future scholars give personnel some basic training before the study.

REFERENCES

[1] Rashid N. Khan, *"Business Process Management: A Practical Guide"*, Meghan-Kiffer Press, 2004.

[2] Stephen A. White and Derek Miers, *"BPMN Modeling and Reference Guide: Understading and Using BPMN"*, Future Strategies Inc., 2008.

[3] Dan Madison, *"Process Mapping, Process Improvement, and Process Management: A Practical Guide to Enhancing Work and Information Flow"*, Paton Press LLC, 2005.

[4] Martin Owen and Jog Raj, *"BPMN and Business Process Management: Introsuction to the New Business Process Modeling Standard"*, Popkin Software, 2003.

[5] *"BizAgi Functional Description V9"*, BizAgi, 2009.

[6] Rob Hailstone, *"Technology Audit: BizAgi Version 9"*, Butler Group, 2007.

[7] Layna Fischer, *"BPM Excellence in Practice 2008: Using BPM for Competitive Advantage"*, Future Strategies Inc., 2008.

[8] H. A. Reijers and S. L. Mansar, *"Best Practices in Business Process Redesign: An Overview and Qualitative Evaluation of Successful Redesign Heuristics"*, Omega, vol.33, p.283, 2005.

[9] P. Green and M. Rosemann, *"Integrated Process Modeling: An Ontological Evaluation"*, Information Systems, vol. 25, pp. 73-87, 2000.

[10] V. Grover, S. R. Jeong, W.J. Kettinger, and J. T. C. Teng, *"The Implementation of Business Process Reengineering"*, Journal of Management Information Systems, vol. 12, pp. 109-144, 1995.