



The process-wide information organism approach for the business process analysis

The process-
wide information
organism

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Abstract

Purpose – To manage linkages amongst value activities, this study seeks to explore to a greater extent the underlying information-processing infrastructure of the value chain, and then to derive a corresponding business process analysis framework.

Design/methodology/approach – The approach is an in-depth investigation of the information-processing infrastructure underlying the value chain activities.

Findings – This study leads to the *process-wide information organism* approach and further delivers a business process analysis framework for describing and measuring mechanisms of managing the information flow underlying the strategic business process.

Originality/value – The information-processing infrastructure underlying the value chain and thus the business process has been identified, and an analytical framework for describing and measuring mechanisms of managing the information flow underlying the strategic business process has been proposed.

Keywords Business process re-engineering, Process analysis, Customer satisfaction, Value chain, Strategic management

Paper type Research paper

1. The strategic business process, the customer value and the process analysis

Executives practicing the art of strategy must make sure that strategic business processes of his/her corporate can create and deliver the differentiating customer values to the target customers. Customers (who to be served), products/services (what customers want), and business processes (how to deliver value to customers) have been focal concerns for strategic initiatives by many CEOs. On the other hand, the capability to create and deliver customer values justifies the value of a corporate. Thus, as mentioned in Kaplan and Norton (2004) and Kumar (2004), the central to cultivate such capability is the way of incorporating organizational resources, management team, policies, functions, and structures into the corporate strategy in the customer value proposition.

All in all, when the target listener is executives, the business process analysis should be based upon the customer value and the strategy, and it is important to be



able to do such analysis. Based upon the understanding derived from such analysis, executives can deploy (or redirect) their resources more effectively. As such, the desirable outcome is more attainable.

In the literature, Porter (1985) analyzed the business process from the perspective of customer value. Porter stated that the issue should be the value, the amount customers are willing to pay for what a firm provides them. Further, he proposed the value chain concept for disaggregating buyers, suppliers and a firm into discrete but interrelated activities. Across activities, there are linkages where information flows allow optimization or coordination to take place (Porter, 1985; Yee and Tan, 2004). As Porter (1985) stated that, linkages are “relationships between the way one value activity is performed and the cost or performance of another” (p. 48) and the ability to identify and manage linkages “yields a sustainable source of competitive advantage” (p. 50). However, to manage linkages is still much more difficult than to manage value activities themselves.

To address this challenge, this study first explores at a greater extent the underlying information-processing infrastructure of the value chain. The exploration leads to the process-wide information organism (PWIO) approach. Based upon the PWIO approach, this study then derives a business process analysis framework for describing and measuring practices (the practicing mechanisms) of managing the information flow underlying the strategic business process.

In the following sections, we will first introduce the PWIO approach, followed by the proposed framework for the strategic business process analysis. The proposed analytical framework is applied to a printed circuit board manufacturer in Taiwan and the corresponding managerial implications are presented in the fourth section. At the end, some discussions and future work are given.

2. The process-wide information organism approach

After receiving service request from other (intra- or inter-organizational) activities, each value chain activity plays the dual role as a server of value-adding provider (executing business tasks for the client) and, if necessary, as a client (releasing requests to other activities for support). In other words, in terms of managing the information flow, there are two kinds of information-processing infrastructures practiced in performing a value chain:

- (1) *Contact points* (CPs) to process information and carry out the corresponding business task.
- (2) *Information channels* (ICs) to carry the information flow.

In order to process information and undertake business tasks that add value to the client, the CP is facilitated with practices (the practicing mechanisms) to:

- receive the information delivered from other CPs;
- execute business tasks based upon the received information;
- feed back the corresponding information; and/or
- release information to the supporting CPs.

Thus, each CP is accompanied with inbound and outbound ICs for carrying the in-coming and out-going information flow, respectively. And, the (intra- or

inter-activity's) information flow passes forward or backward through the associated ICs seamlessly to send out or respond to a request. Therefore, there is a variety of groups of functionally connected CPs, of which practices work together to perform value chain activities. In addition, across practices of CPs, there are practices of ICs to carry the information flow.

On the whole, a business process can be recognized as a series of related business tasks that are performed by the practices of a group of functionally connected CP/ICs.

In practice, a staff, an *ad hoc* team, or an information system could act as the practice of a CP. And a memo, a post mail, a phone call, a face-to-face meeting, a teleconference meeting, an intranet, an e-mail, a (beeper or wireless) message, or a web information system could act as the practice of an IC. Furthermore, there may be multiple practices of a CP/IC. In brief, the practice of the CP/IC is in one of the following forms: manual, automatic, or parallel (for having both manual and automatic practices simultaneously).

The practice of each CP/IC should create value (via the lower cost or improved performance) for the client CP. A difference in the practice of a CP may deliver a different quality of coping with the corresponding business task. For instance, an experienced manager can deal with unexpected business scenarios better than a decision support system or a junior manager. A difference in the practice of an IC also differentiates the value-adding outcome of the associated CP. For instance, a phone line at a time epoch can serve only one customer, but the audience served by an Enterprise Information Portal at any time epoch may be more than one. The cost associated with a different practice of each CP/IC may vary as well.

The discussion of the ICs identifies the management of linkages among value chain activities. Each IC identifies the existence of a linkage between two CPs, and the investigation of the degree of integration of practices of CP/IC can explore the management of linkages. Better integrated practices of CP/IC can enhance the optimization or coordination occurred in the information flow to leverage linkages between activities. On the other hand, the asymmetry existing in practices of the (inbound/outbound) IC between two CPs would impede the effectiveness of communication and the task-handling, which in turn would deteriorate the corresponding customer value. For instance, a firm provides an e-mail practice in the (outbound) IC to customers, but some customers are incapable of receiving e-mails. Practices of this very (inbound/outbound) IC are asymmetric.

For each strategic business process, the firm maintains a corresponding PWIO that embodies practices of all involved CP/ICs. Business processes that are critical to business success are expected to proactively responsive to the dynamic business environment. As such, these functionally connected CP/ICs are adaptive in terms of their functionalities and practices. This adaptation leads to an analog between the PWIO and an organ in the living body.

The amount of value-adding that a strategic business process provides to customers depends on how well the corresponding PWIO are managed. Through the PWIO, the firm not only handles the corresponding (transaction and non-transaction) information flow, but also carries out all the involved business tasks. The collective quality of information and the smoothness of the information flow are determined by the PWIO. The higher the collective quality and the smoothness, the larger the customer value the process can provide. On the other hand, a poor practice or, to the extreme, a paucity of

an individual CP deteriorates the collective eminence of a business process, which in turn would impede the delivery of customer value.

3. The proposed business process analysis framework

To be able to obtain the strategic outcomes, it is executives' responsibility to identify the strategic initiatives and the associated strategic business processes. Then, for each (identified) strategic business process, the following analytical steps are proposed:

- developing the corresponding business process table;
- developing the associated practice tables;
- completing the column of objective and performance measure in each practice table; and
- integrating the objectives and measures reported in each practice table into the corresponding columns of objective and measure in the business process table.

The detail of each step is as follows:

- (1) *Developing the business process table.* The corresponding business process should be a key process for delivering the desirable strategic outcomes. There are four columns in a business process table: responsibility, function, objective and performance measure. At the current step, only the responsibility and function columns need to be determined and filled in.
- (2) *Developing the associated practice tables.* Each practice table explores the practices of all CP/ICs associated with each function listed in the business process table. There are seven columns in the practice table to describe who (or what mechanism) will perform the job (practice of CP), tasks need to be done (job description of CP), how to receive relevant information (practice of inbound IC), content of in-coming information (job description of inbound IC), how to convey the information out (practice of outbound IC), and the content of out-going information (job description of outbound IC). As to the last column, it delineates the objectives corresponding to the function and the associated indicators that measure the objectives' accomplishment. At the current step, except for the last objective/performance-measure column, all the other six columns are determined and filled in. The corresponding practice of the other connected CP is shown in the parenthesis. The less important and redundant practices of CP/IC should be omitted.
- (3) *Completing the column of objective and performance measure in each practice table.* Management of a specific function cannot take place if its related objectives cannot be measured. The measurement, however, would not be possible in lack of a good description of objectives of that function. Therefore, for each practice of the CP/IC, we first determine and fill in the associated objectives; the performance measures that quantify the corresponding objectives are then developed.

There are two kinds of performance measures involved: one is at the summary level and the other is at the detailed (dissected) level. For instance, when the CP in the sales department checks a backing up order with the corresponding CP in the production division, the summary performance

measure is the response time of checking a backing up order, and the detailed performance measures are process times of checking production schedule (performed by the CP responsible for production scheduling) and raw materials availability (performed by the CP responsible for materials warehousing). In each practice table, only the summary performance measures are listed, and the performance measures detailed to the connected CP are not reported.

- (4) *Integrating objectives and performance.* Integrating objectives and performance measures reported in each practice table into corresponding columns of objective and measure in the business process table.

In brief, the former two steps belong to the description phase, and the later two the quantification phase. In the description phase, we depict the corresponding business tasks and PWIO associated with the strategic business process. In the quantification phase, the corresponding objectives and performance measures are assigned with foci on the strategic initiative. The point needed to be stressed is that each chosen measure should be assigned a role in guiding the corresponding practice's performance towards the strategic goals.

Current literature lends itself to the performance measures assigned at step 3. For instance, one can refer to the researches on the profitability, productivity and customer value of the information technology and applications (IT/IS) (Hitt and Brynjolfsson, 1996; Devaraj and Kohli, 2002, pp. 6-8; DeLone and McLean, 2003; Kuo *et al.*, 2004; Rao and Miller, 2004) for performance measures that evaluate the practice of each automatic CP/IC. The candidate performance measures include, but are not restricted to, an amount of errors, severity of errors, response time (process time), rate of tasks performed, the reduction in process/search costs, sales growth, market share, customer satisfaction/loyalty (repeat purchases), old customer retention, new customer acquisition (growth in new sales), and customer profitability contribution.

On the other hand, one can refer to studies in the human resources (Bohlander *et al.*, 2001; Roos *et al.*, 2004) for measures of the practice of each manual CP/IC. Compared to measures for gauging the practice of the automatic CP/IC, the measures concerning the practice of the manual CP/IC involve issues of not just the productivity, profitability and customer value, but also personal traits, including the intelligence, the experience, the creativity and (sometimes) the ambition.

4. An application of the proposed analytical framework

Table I documents a business process table corresponding to the revenue cycle of a printed circuit board manufacturer in Taiwan[1]. In Table I, the first column documents the primary responsibilities of a revenue cycle: developing/contacting customers, processing sales orders, picking/packing/shipping, billing, and collection of cash. The second column outlines the functions corresponding to each responsibility identified in the first column. The third and fourth columns summarize the objectives and performance measures reported in all corresponding practice tables. Figure 1 shows the graphical depiction of the practice deployment of all CP/ICs of the PWIO corresponding to Table I.

For the sake of succinctness, only developing new customers (function 1-1) and requesting backing up order functions (function 2-4) presented in Table I are chosen for

Table I.
The business process
table corresponding to
the revenue cycle of a
specific firm

Responsibility	Function	Objective	Measure
1. Develop and contact customers	1-1. Develop new customers 1-2. Contact customers	Acquire new customers Develop customer relationships	Number of new customers Revenue from new customers/markets
2. Process sales order	2-1. Take order 2-2. Approve credit 2-3. Check inventory availability 2-4. Request backing up order 2-5. Approve/reject order 3-1. Pick and pack products 3-2. Ship products	Respond efficiently	Customer satisfaction Response time, from start of customer contact to order completed Order complete percentage
3. Pick, pack, and ship		Deliver responsively to customers Enhance delivery quality	Lead time, from order to deliver On-time deliver percentage Percent of items delivered with no defects Number/frequency of customer complaints
4. Bill and maintain accounts	4-1. Update accounts 4-2. Bill	Respond credit inquiry timely Screen customers with bad credit	Response time to credit checking Bad debt percentage
5. Collect cash	5-1. Remit and deposit	Bill accurately Collect the receivables timely	Billing errors Account receivable turnover

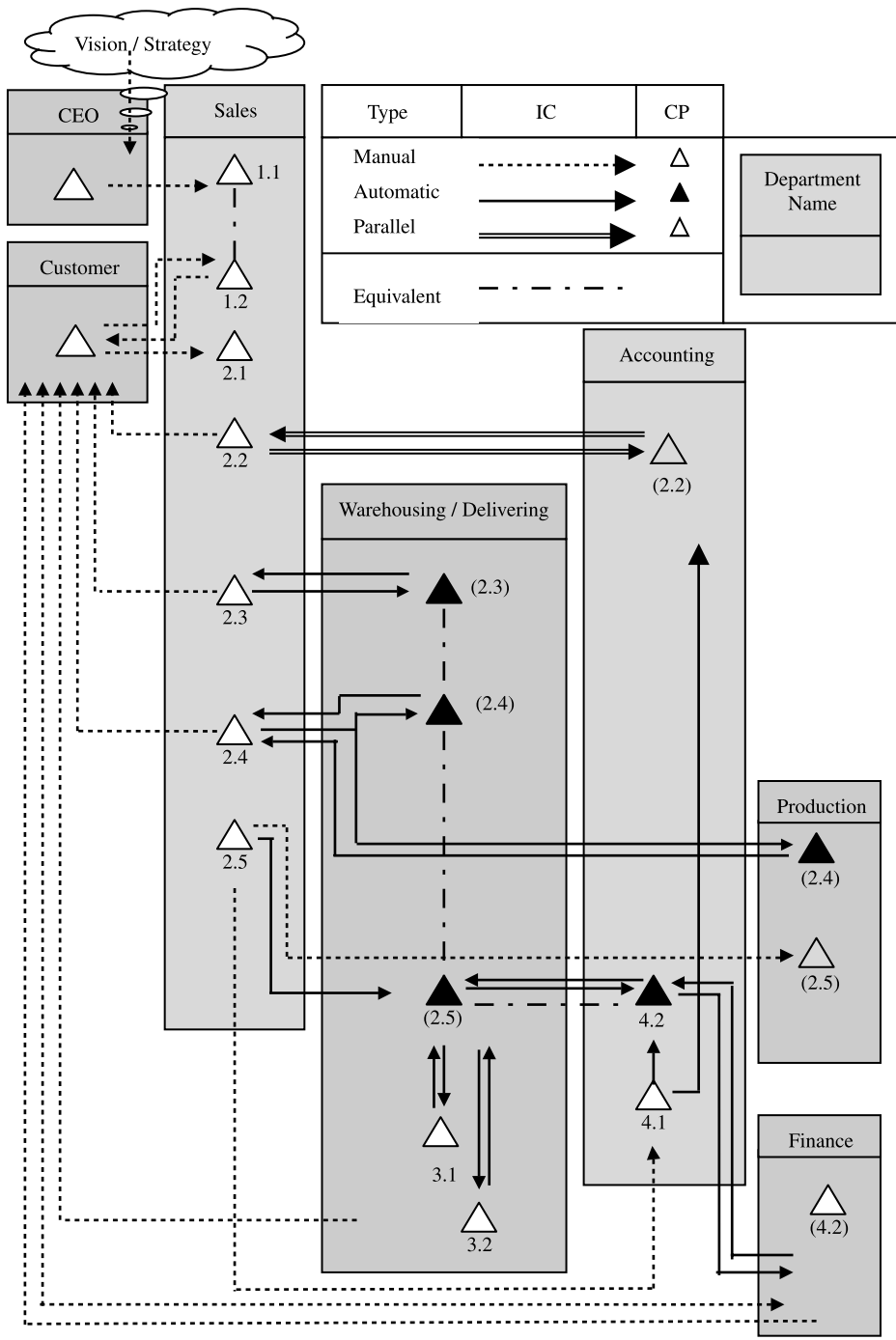


Figure 1. A graphical illustration of the CP/IC deployment in the revenue cycle shown in Table I. The practice of the connected CP is shown within the parentheses

the illustration. Table II is the practice table for the function of developing new customers, while Table III for the function of requesting backing up order. As illustrated in Table III, in order to fulfill the order from the customer (the job description of the CP), the sales assistant (the practice of the CP) inquires whether the order can be met with the inventory information system and the production management information system through the ERP system (the practice/job description of the inbound/outbound IC). The sales assistant also acknowledges the corresponding production schedule through calling/e-mailing the customer and through the EPR system to the warehousing and production departments (the practice/job description of the outbound IC). To retain the customer satisfaction, the corresponding objective is the prompt response to the customer's inquiry; to gauge whether such objective is achieved, measures reflecting reduction in the cycle time of processing an order are appropriate.

There are four promising managerial implications derived from this application. First, the following information-processing strategies should be highlighted after the analysis:

- the decision of deploying automatic or manual practices on some CP/IC should be based on a comprehensive perspective of the business process, not merely on the CP/IC itself; and
- the decision of deploying automatic or manual practices on some CP/IC should also be based on the customer value-directed strategic initiative, not on the technology itself;
- any asymmetry existed in practices of the (inbound/outbound) IC between two CPs should be corrected in order to improve the effectiveness/efficiency of communication and the task-handling.

Second, we can develop a balanced-scorecard[2] perspective-based layout of relationships amongst the obtained objectives[3]. For instance, Figure 2 shows the layout of relationships amongst the obtained objectives corresponding to the revenue cycle shown in Table I. This layout transparently depicts the cause-and-effect relationship of value-adding activities in the strategic business process. The identification of these relationships provides a foundation for the improvement or dramatic process reengineering in the strategic business process.

Third, we can develop ways of aligning the IT/IS with the business process and enhancing the IT/IS to improve the effectiveness of the business process. For instance, Figures 1 and 3 show the level of integration of practices of CP/IC in forms of manual, automatic, or parallel. It is perceived that the adoption of IT/IS serves as an enabling element for achieving breakthroughs in process performance to reap customer value (Kaplan and Norton, 2004; Leem and Kim, 2004). Thus, the (physical) reliance of manual practice of CP/ICs of the business process implies the potential process improvement through deploying better IT/IS counterparts. Furthermore, the bottleneck or the inefficient IT/IS practices amongst the business process should be picked out and corrected via deploying better IT/IS practices.

Fourth, the effort-achievement relationship can be better understood and enhanced through segregating the obtained performance measures into performance drivers (leading indicators) and outcome measures (lagging indicators) accompanying with the (processing) orders of the (business) process. Figure 3 shows such a segregation corresponding to the revenue cycle shown in Table I. A relationship between leading

Practice	CP		Inbound IC		Outbound IC		Objective (measure)
	Practice	Job description	Practice	Job description	Practice	Job description	
Salespersons in sales unit 1 of sales department		Develop new customers in Taiwan	Teleconference meeting, mail, phone call (from CEO or the special assistant of CEO)	Bring in marketing policies from management			Acquire new customers (number of new customers; revenue from new customers/markets)
Salespersons in sales unit 2 of sales department		Develop new customers in Mainland China					Develop customer relationships (customer satisfaction)
Salespersons in sales unit 3 of sales department		Develop new customers in other area					

Table II.
The practice table for the function of developing new customers shown in Table I

Table III.
The practice table for the function of requesting for backing up order shown in Table I

Practice	CP		Inbound IC		Outbound IC		Objective (measure)
	Job description	Practice	Practice	Measure	Practice	Job description	
Assistants in sale-supporting unit of sales department	Make inquiry to warehousing and production departments for backing up order information Communicate and make arrangements to meet customer requests (date/quantity, etc.)	ERP information system (from raw material inventory information system in warehousing department) ERP information system (from production management information system in production department)	Bring in the result of inquiry about backing up orders (from warehousing and production departments)	ERP information system (to raw material inventory information system in warehousing department) ERP information system (to production management information system in production department) Phone call, e-mail (to customers)	Request for backing up order (to warehousing and production departments) Acknowledge the production schedule of the customer's order (to the customer, the warehousing department, the production department)	Respond timely for backing up order (response time, from start of requesting for backing up order to response)	

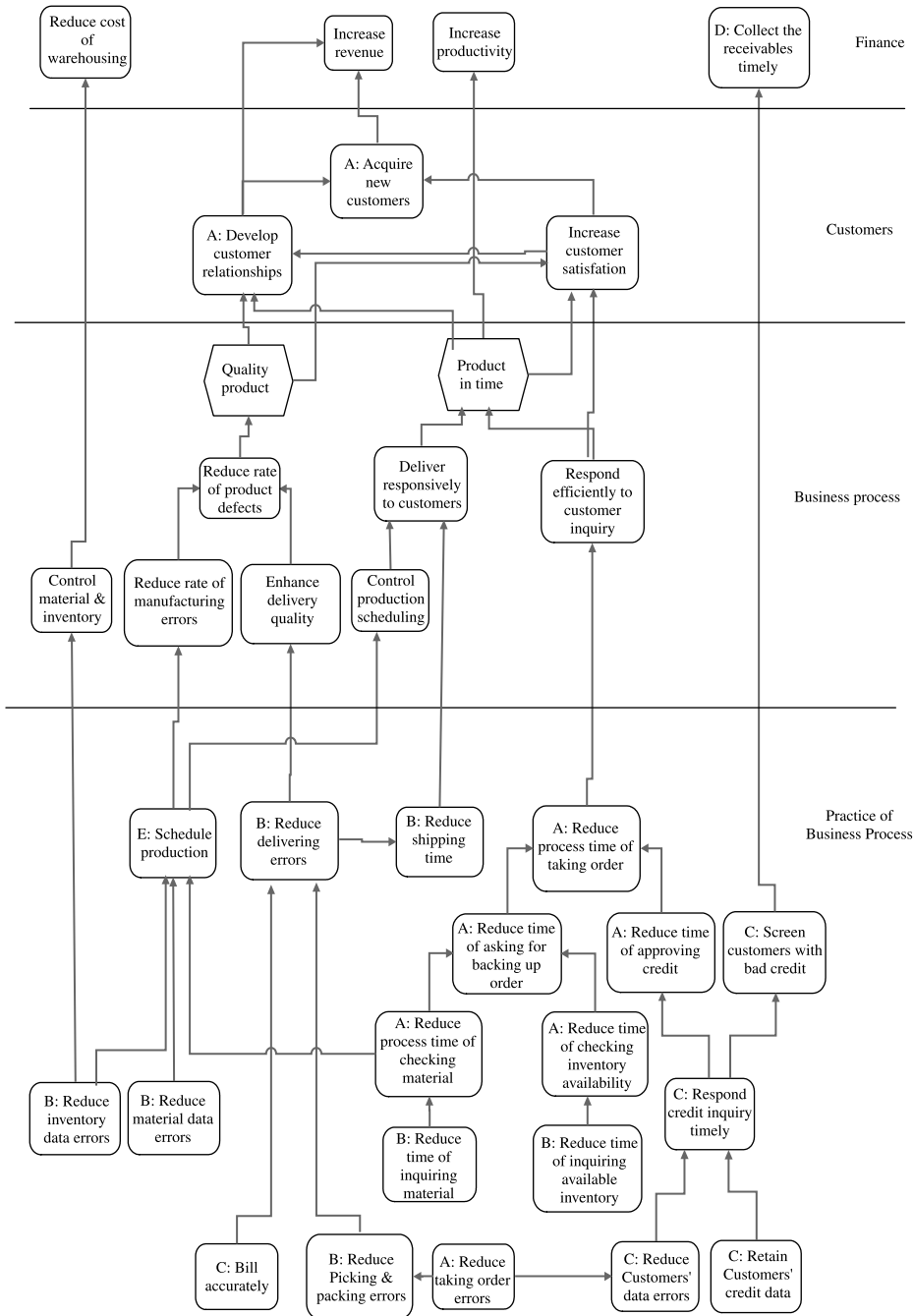


Figure 2. The layout of relationship among objectives associated with the revenue cycle shown in Table I; the alphabet A denotes for the sales department; B for the warehousing and shipping department; C for the accounting department; D for the finance department; and E for the operation department

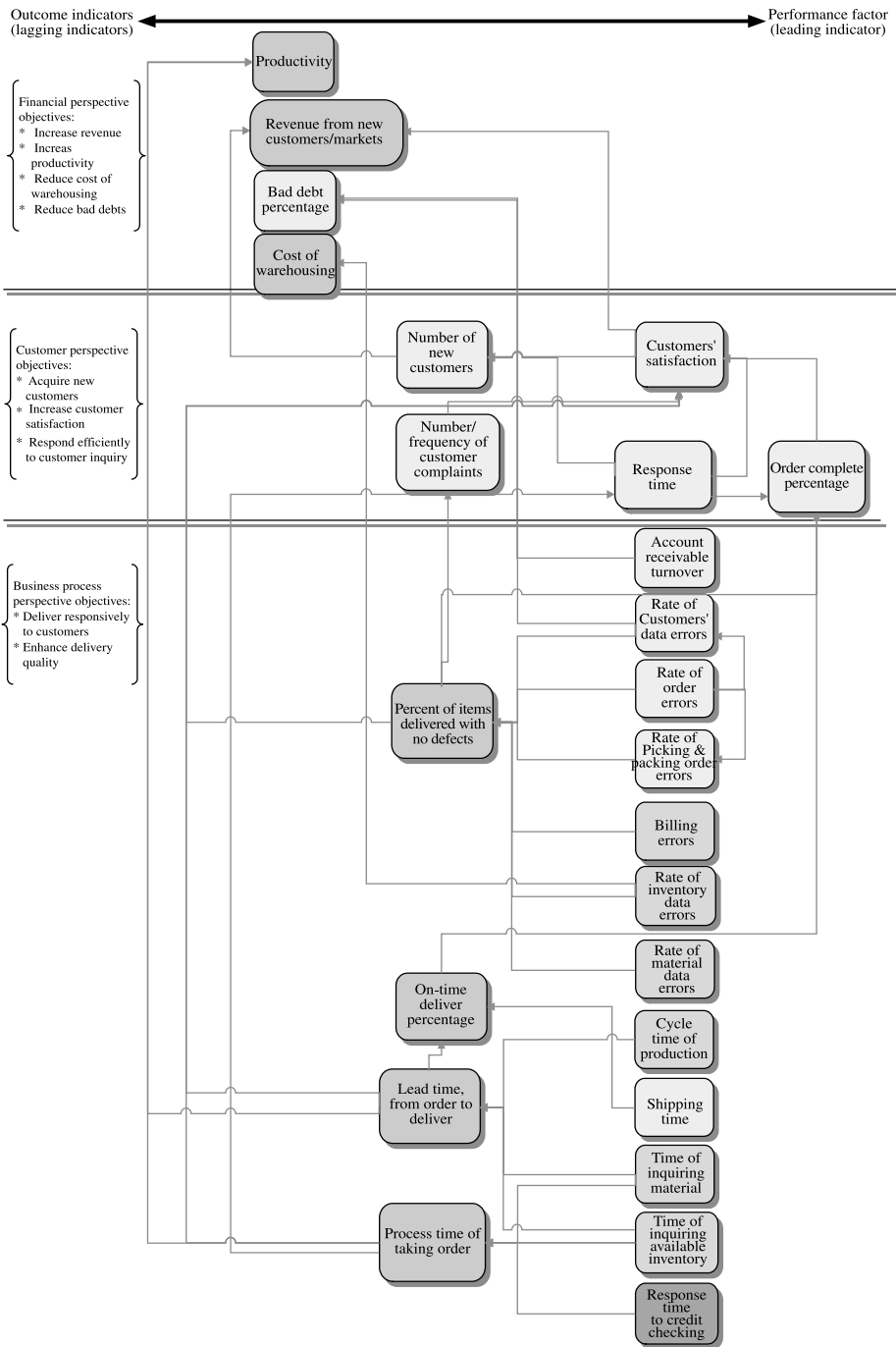


Figure 3. The mapping of performance drivers and outcome measures associated with the revenue cycle shown in Table I. The yellow indicates that the performance measure is applied to a manual case, blue an automatic one, and red a parallel one; green indicates that the performance measure is a derived one

and lagging measures can serve as a map of cause-and-effect linkages that describes the way of converting the intangible into tangible values (e.g. the financial outcome).

5. Discussions and future work

From the literature, the analysis of a strategic business process should focus not only the technological perspective, but also the operational, managerial, strategic, and organizational perspectives. Furthermore, Yu (2005) states that an implementation of the IT/IS is not the final goal/stop but a “go live” point/start; likewise, any implemented strategic business process is not an end but a beginning for the continuous improvement. In addition, the alignment of objectives and performance measures without targeting at the proposed business direction could be detrimental to the organizational performance (Kaplan and Norton, 1997). All in all, it is important to have a clear picture of depicting the association of the strategic business process with the customer value-oriented strategic initiative and the associated objectives/measures. This kind of picture brings forward the potential process improvement and buttresses the generation of customer values.

In our proposed analytical framework for the implemented strategic business process, the business direction and customer value are considered when the associated objectives/measures are assigned at the quantification phase. Thus, the analyses resulted from the proposed framework help analyze the implementation of the customer value-oriented strategic initiative.

The proposed analytical framework leads to some pictures depicted the relationship between the customer value proposition and the practices deployed at the strategic business process. An in-depth thought over the obtained pictures helps recognize the effectiveness/efficiency of the associated practices, and may result in subsequent process improvements in terms of the effectiveness/efficiency and the innovativeness. For instance, one may conduct the analyses of the current strategic business process and the expected counterpart for a new strategic initiative, respectively. The comparison of the current and future processes will lead to an in-depth understanding about the value activities underlying the strategic business processes and bring forward the potential process improvement via enhancing the activity performance and/or deleting the non-value-adding activity. One future work is to extend this kind of knowledge to the implementation of the activity-based costing system and the activity-based management.

It is perceived that the IT/IS can align the information capital with the strategic business process. Intuitively, the proposed analytical framework provides a means of understanding whether or how the automatic practices help to align the information capital with the (strategic) business process. This issue deserves a further study.

Notes

1. The study of this revenue cycle is based upon the case study of a project sponsored by Institute for Information Industry, Taiwan. For details of all practice tables please send a request to the corresponding author.
2. The balanced-scorecard concept proposed in Kaplan and Norton (1997) includes four perspectives: financial, customer, internal process, and learning and growth. It is suggested that measures derived from these four perspectives are more comprehensive and refined in measuring and managing the performance of an organization.

3. As this study focuses primarily on proposing an analytical framework for describing strategic business processes that deliver customer value and thus financial outcomes, only the financial, customer, and internal process perspectives are explicitly presented in Table I. The objectives and measures therefore, are not meant to be inclusive for a general inference.

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