2
AN APPROACH FOR BUSINESS VALUE EVALUATION OF INFORMATION SYSTEMS

Ali Mahdavi Adeli, Azizah Abdul Rahman

2.1 INTRODUCTION

The business and IT alignment has been a long time issue [1] and even though different potential models have been suggested, by looking at some of the reports on current situations [2] and [3] and reviewing some surveys [4] reveals that the problem still remains. This desired strategic alignment of business and IT can be interpreted as how IT and IS create business value. To be more precise it is needed to know what business value to an organization is and how to effectively evaluate it for investment purposes.

IT portfolio management (ITPM) was first introduced by McFarland [5] as an attempt to allocate IT resources on suitable IT projects using a risk-based approach. ITPM is accomplished through application portfolio management (APM) and project portfolio management (PPM) [6] as two sub-portfolios of ITPM. Both of them require the business value assessment of the applications or projects respectively. To highlight its importance, a successful ITPM results to increased Return on Assets (ROA), improved business-strategy alignment, cost reduction, improved Return on Investment (ROI), professional respect and competitive advantage among other benefits [7]. Two most important hurdles for successful implementation being business alignment and measuring IT's value to the business, both coming from improper business value identification and assessment.

Furthermore, applications, in the APM context, or IT projects generally provide, enable or support some types of services or non-manufactured products. Therefore we focus on service organizations where the main business values lie in the service products, such as the Higher Education (HE) sector. Moreover, we consider organizations with a non-profit nature or at least not merely profit based orientation. The reason is that the ultimate values for these organizations are not limited to cost and revenue, hence better showing how merely outcome-based measures are insufficient.

The paper is organized as following. First we give a summarized review on available methods for business value assessment and explain why we regard it as a rather outcome-based approach and for what reason it is not sufficient for that purpose. Then we suggest complementing it with a process-based perspective and how these two perspectives can complement each other. We propose two conceptual models for each of these perspectives and how they can be applied on a university as a case of a service organization in the HE sector.

2.2   BUSINESS VALUE ASSESSMENT PERFORMED RATHER OUTCOME BASED

There is an obscurity in quantifying business value of information systems as its benefits are generally intangible. In management, business value is a term that includes all forms of value that determine the well-being of a firm [8]. IS business value is defined as the sustainable value added to the business by IS, either collectively or by individual systems, from an organizational perspective relative to the resources required [9].The IT business value is commonly held to be tied to an organization's business strategy. Hence, assessment of business value should be closely related to strategic goals [10] or on a lower level strategic objective of an organization. These strategic goals are set based on the mission of the organization which comes from its vision. More

specific measures are derived based on the strategic objectives to enable the business value evaluation of Information systems and IT. Some of these methods adopt tools originated from the business side to better keep in alignment with the business. Methods that are solely based on technological measures tend to inherently neglect the business perspective and fail the expected business requirements; hence we do not even bother mentioning about them.

Reviewing studies that have focused on business value evaluation approaches [9] show the predominant outcome-based perspectives in them. For example, Critical success factors (CSF) that support a strategic objective are defined and used for this purpose. An information system's value can be assessed based on how many of these CSFs it supports or contributes to [11]. Another approach uses the SWOT analysis to attain an assessment of business views of IT services for different categories to assess the areas of IT performance, which is used to evaluate which applications have a higher business value [12]. The balanced scorecard (BSC) and relevant KPIs in each sector can also be used to assess the business value of a potential project or application. Although the metrics, KPIs, used on scorecards sometimes still suffer problems such as lagging metrics, lack of metrics in areas with intangible value (HR, ethics, etc.), rudimentary metrics for customer satisfaction and etc. [13]. Such issues further affect their aptness for assessing BV, especially regarding BV of information systems which is sometimes more based on intangible values.

All these approaches attempt to assess the BV of an IT project or application (information system) by looking at how far it directly or indirectly contributes to the identified indicators, which are all representing the expected or desired outcomes only.

2.2.1   Critique on, Merely Outcome-Based, Approaches

All out-come based approaches assess the value of information systems based on how it is contributing to the end results and doesn't consider the processes that lead to this outcome which is of value to the organization. In service firms, the organization's business value is coming from its service products. The service product's value is affected by different elements and/or processes. Even in non-service organizations this remains true with differences in the processes and end results. Hence, an identified low value based on merely outcomes, may have neglected some well-performing elements along the value creation process as this low value result might be due to other low-performing elements throughout the process. Also, an apparently high-value result may falsely cover low-performing elements along the value creation process as an element's low performance is not seen because other elements have covered it in this case. In both cases the outcome-based result doesn't give an insight about the different elements' performance throughout the value creation process. Moreover, in non-profit organization like the HE sector, outcome-based analysis can neglect some organizational or educational dimensions like teamwork, harmony, welfare of students/staff, organizational atmosphere, and etc., which are important, intangible values created and present throughout the processes but not seen in a outcome-based assessment.

Therefore we suggest having both outcome-based and process-based views in order to have a more coherent approach towards business value assessment. Integrative views on IT (IS) business value define it as the organizational performance impacts of information technology at both the intermediate process level and the organization-wide level [14]. Our suggested approach will be also better satisfying such definitions of IS/IT business value.

Moreover, we introduce specific methods for each of the outcome-based and process-based perspectives as conceptual ways to operationalize those perspectives. We consider our method for the outcome-based perspective as an alternative and not a superior

one on itself. Considering that all the former assessments on BV have already had an outcome-based perspective, hence increasing the quantity and probably quality of previous works done on such methods.

2.3   A PROCESS BASED PRESPECTIVE ON BV EVALUATION USING THE SCV

We argued the need for a process-based perspective towards business value and elaborate it here for service organizations as mentioned in the introduction. In service organizations business value creation is through the different types of services. The services go through different processes and may be affected by other services through these processes, along which they obtain value. We found the service value chain (SVC) an appropriate method to represent this view as it will be further explained throughout this part. The original value chain model for products by Michael Porter [15] cannot be applied to services as they are inherently different to physical products, but the same idea of value-adding activities that create the value of products is adopted for the SVC. Before going for the SVC we took into account the "value shop" and "value network" models [16] too, but they do not suit this purpose as well as they are created for specific businesses, that can be service based but do not generally apply to service firms. The main difference of the SVC to the traditional value chain is that, for services, there is no throughput of a material product through the processes of a company, but a customer(s) throughput through the processes between the organization and the customer(s) [17]; processes here being the services of the provider. In short, we take a value oriented approach towards services for creating the SVC. All the elements in the service value chain are meant to create some added value or have a value contribution. Thus, the SVC[1] presented in Figure 2.1 shows how business value

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[1] The SVC we adapted for our purpose is based on (Buhn, M. and D. Georgi), "*Services Marketing: managing the service value chain*", which has presented it for a different

is created throughout the activities in the chain, representing a process-based perspective towards value creation. It is also a functional approach for the service provider's activities to create value.
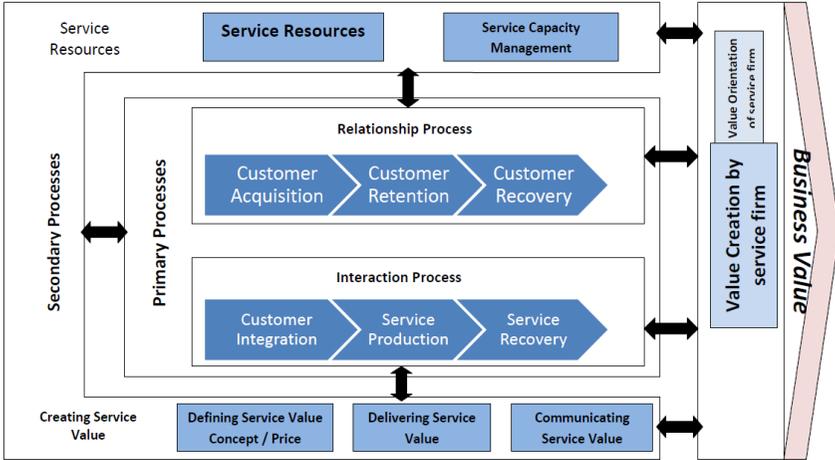

Figure 2.1 The Service Value Chain (Adapted from [18])

To explain the value contribution of each of the SVC's elements it is needed to first specifically define what will be business value to an organization. Here we consider a university in the HE sector as the case of a non-profit service organization, because its business values exceeds the common financial value parameters of 'cost' and 'revenue' as fundamental business value elements, which is the case for merely profit-based service firms. Thus showing the general applicability of the model to service-firms based on what is defined as 'business value.

The following are identified as autonomous value creators based on the strategic goals of the mentioned case:
(a) Revenue

purpose and from a different perspective. Our perspective on and application of the idea is the originality of our approach.

(b) Expenditure/Cost
(c) Quality (of publications, Teaching & Learning processes, programs)
(d) Impact (of publications, programs)
(e) Image/Standing/Ranking

The value creators like "Image" or "quality" may seem to be of value only if they eventually lead to revenues, but in the HE context as an example these are independent value creators on themselves. A similar scenario can be true elsewhere depending on the service organization being analyzed and based on the set business values. The customers or, for our case of a university, stakeholders can be but are not limited to:

(a) Students (usually considered as the main customer).
(b) Staff (including Professors, Lecturers, Researchers and other academic and non-academic staff. As they are considered as part of the organization, their role can interchangeably be looked at as the provider and/or the customer).
(c) Government (providing budgets, looking for the output of the universities, policies.
(d) Industry (collaboration between it and the university in different ways).
(e) Other Universities (as research partners, other types of collaboration).

2.3.1 Primary Value Processes

The primary value processes are the activities that create a direct value. In services, value is created by the 'throughput' of the customer or his objects in the service production process. This throughput creates a direct value for the customer as well as for the provider. A main characteristic of services is that the production of services is realized by means of interactions between the service provider and its customers, thus the customer participates in the service productions.

Interaction processes describe the throughput of a customer via a service process. The value creation is by affecting the revenues, costs, quality, impact and image of the provider. It consists of three chains:

(a) Customer integration: facilitating the customers' integration into the service production process.

(b) Service production: the main part of the service process that takes place in the so-called service encounter which is perceived by customers as a row of incidents. The type of service can be categorized based on the type of service resource (human or automated) and the external factor (human or object). The quality of the service is determined by both provider and customer behavior.

(c) Service recovery: failures cannot be prevented in service production. Service recovery helps to increase customer satisfaction, decrease probable costs, avoid diminished perceived quality and prevent image degradation. Service recovery measures can concern the Error rectification (correcting the service) or Compensation (offering a benefit which substitutes for the defective service).

Relationship processes concern the customer's throughput through a relationship with the provider. The value creation is because building a relationship to the customer helps create further revenues by expanding customer relationship and elevating the impact and image. It consists of three chains:

(a) Customer acquisition is initiating customer relationships and obtaining new customers who have not yet used the services of the provider. Activities of this stage include reducing uncertainty, differentiating from competitors, enhancing word-of-mouth communications (by current customers) and stimulating customers.

(b) Customer retention: convincing the customer to stay in the relationship. The determinant of customer retention can be divided into two groups. Alignment, which concerns a voluntarily, emotional connection between the customer and

the provider that can be explained by the psychological appreciation of the provider by the customer like customer satisfaction, trust or commitment. Bonding, respects not an emotional but formal connection between customer and provider that causes switching barriers (situations that impede the termination of the relationship). There are four types of switching barriers: contractual, economic, functional and situational.

(c) Customer recovery: regaining lost customers in order to renew the value potential for the provider.

2.3.2   Secondary Value Processes

These processes influence the primary value processes and affect value indirectly. They are differentiated as "creating service value" and "managing service resources".

In the first category the service is defined and the customer presented with the service concept. As the model shows it can support the primary interaction processes. In order for the defined service concept to create value, its value should be communicated before and during the service process (communicating service value) and provided by the service delivery activities. The service value creation consists of three elements: Defining the service concept & its value: The customer needs to be presented with the service and its definition to know how he/she can benefit from it; this is called the service product and is considered as the value contribution. Furthermore, the service product is comprised of three elements which affect the quality, impact and image of the provider and influence customers' decision regarding the usage of the service.

(a) Core services: the basic needs and expectations a service provider aims to fulfill. It determines the customers' experiences with a service and their perception of the service without experiencing it. The core services affect the other value chain elements like the service process.

(b) Supplementary services: additional services (and goods) that can be a catalyst for the customer to choose the service. They can be categorized regarding their mandatory existence to 'Facilitating / mandatory services' (necessary for the delivery of the main service) or 'Value added services' (not necessary but differentiating the service from other providers).

(c) Service program: structures the core and supplementary services of the provider. Comprehensiveness is a distinctive element of the service program.

Both the core and supplementary services run through a so-called service product life-cycle which causes three different service product decisions: Innovations, Modifications or Eliminations. The service price has a direct value effect by being a revenue component and also an indirect value effect by determining customer behavior.

Delivering service value: The service delivery decisions imply various value effects. Service place, time and channels affect delivery cost, revenues, quality, impact and image via customer perceptions (value contribution).

Communicating service value: service communications affect image and impact and drive customer behavior (value contribution). Three types of service communications can be employed:

(a) Interactional communications.

(b) Relational communications.

(c) Brand communications.

The other category of secondary processes is 'Managing Service Resources' which consists of the following. Service resources: can be divided into three groups; employees, tangibles and technology:

(a) Service employees drive cost by their salaries and revenues via their impact on customer behavior. Measures for managing employee behavior include defining employee roles, evaluations and feedbacks to employees, recruitment and qualifications and motivations.

(b) Service tangibles affect value by being a quality indicator in the eyes of the customer.
(c) Service technologies are an integral part of the SVC and affect all other elements of the chain. Without them the service process may simply not be possible. Regarding tangible value effects, technology has diverse impacts on the revenue side of value, although its cost effects are the most obvious. Service technology helps make processes more efficient and contrary to what might be thought, in the HE sector cutting technology expenditures during financial downturn can harm more than the expected benefits [19].

Service capacity management: service capacity problems are defined by gaps between capacity and demand, when demand cannot be met by available capacity (capacity gap) and when the capacity is not filled by the given demand (demand gap). Both affect value via revenue, cost, quality and impact effects and are determined by demand level, demand dynamics and adaptability of service resources. There are 4 types of capacity management measures:
(a) Long-term capacity determination.
(b) Short-term capacity adjustments.
(c) Demand adjustments.
(d) Waiting time management.

2.3.3   Applying the SCV for Business Value Assessment

The introduced SVC gives a general approach for a process-based business value evaluation. In order to apply it on a specific service organization it is suggested to adopt it as following:
(a) Identifying the value creation parameters for that organization (cost, revenue, image, impact, quality were used for the model).
(b) Mapping the identified activities, business functions to the relevant elements of the SVC model.

(c) Review how the elements of the SVC, and the activities mapped onto them, contribute to value creation based on the set business values.

      The information systems or more specifically the applications and/or IT projects (regarding the ITPM context) can be assessed based on how far they contribute to, enable or support each of the elements of the SVC (Hereafter, instead of mentioning information systems, applications and projects for which the BV assessment may be used we use 'application' in the APM context to simplify the explanations). As an example for the university case, an e-learning system contributes to the delivery of service value by providing a new 'service channel', eliminating the 'service time' and 'service place' limitation of specific T&L processes and enhancing the overall T&L process and potential impact of programs (in the 'service production' element), hence having direct contribution to two of the SVC elements. Basically, the e-learning will be considered for the to-be provided T&L services and academic programs, in the 'defining the service concept & value' element, showing its indirect contribution to this element as well.

      In order to make this evaluation quantifiable so that comparisons among different assessed applications will be possible we can assign scores to each evaluated application per element based on how far it contributes to, enables or supports that element. The sum of these scores per each element divided by the maximum possible score could represent the application's BV. But the following issues have to be taken into consideration:

(a) An information system, application or project cannot be expected to make contributions to all elements in the SVC. Hence to set a maximum score as a scale against which the application's BV is compared we need to set this maximum score on a logical basis. A possible method would be to first assess all identified applications' score for each element $(score(i))$, also taking into account potentially required

applications that can have ideal role playing in the SVC, and calculate the overall score for each application (the sum of its scores per elements = total score). Assuming that at least one of these applications (also potential, currently not existing applications) is satisfying the maximum expectable contribution to the SVC, the highest total score can be considered as the maximum score (max. Score). Hence the value of each of the rest would be their score divided by this maximum score value of application.

$$(j) = \frac{total\ score\big(Application(j)\big)}{max.\ score}$$

(b) The elements in the chain may not all have the same value to the value creation process. For example the 'service resources' can be thought as not affected by any application, hence no application getting a score for this element. Or the 'customer recovery' element may have a lower value in the context the SVC is being used for. This can be corrected by applying weights ($W(i)$) to each element of the SVC as appropriate for its application. Thus, if the let's say 'service resources' element is considered as mentioned above, a weight of 0 will be assigned to it. In this case the overall score calculation would only change in terms of applying these weights and using the weighted average mean calculation with respect to the maximum set score, as explained in the previous point. The formula is shown below assuming "k" = the number of elements for the SVC.

$$value\ of\ application(j) = \frac{total\ score(j)}{max.\ score}$$

where

$$total\ score\ of\ each\ application = \frac{\sum_{i=0}^{k} w(i) Score(i)}{\sum_{i=0}^{k} w(i)}$$

and $max.score = highest\ total\ score$. Not having specific parameters to apply weights could make the weighting of elements a subjective process which may not be desired. Therefore mapping the activities (business functions) of the organization on the SVC can provide a better insight on which elements are of higher value.

Ideally, there would be a complete map of business processes cross-referenced with business initiatives. It would indicate how the business owners can assign business value to each application [20] or be used as a reference to complement the SVC. Although, the presented SVC is meant as a functional approach, as this ideal might not be practically feasible.

2.4   AN OUTCOME BASED PERSPECTIVE ON BV EVALUATION USING THE BSC

From an outcome-based perspective the business value can be assessed based on the strategic objectives which are inferred from higher level strategic goals. Strategic objectives are well established in the balanced score card (BSC) method [21] as it examines the performance from four interrelated perspectives; stakeholder perspective, internal process perspective, learning & growth perspective and financial perspective, which make it reliable in terms of business and IT alignment. Moreover, the balanced score card is a well established method for strategic performance management and for the development of strategy itself [22]. Hence it can be utilized as a reliable source, probably already available in the organization, to retrieve the strategic objectives. Furthermore, respecting our focus on service organizations with a non-profit orientation the BSC is a suitable option [23] as it also considers the intangible and non-financial assets that create value in such organizations [24].

Since we want to utilize the BSC for the purpose of BV assessment, which is used in ITPM as well, it is needed to emphasize that we do recognize that ITPM and BSC emphasize on

different goals. The agility of the investment adjustments is considered as portfolio management's biggest advantage, but the business-IT alignment issue still exists [7]. Hence, we do not implement the BSC but utilize it in terms of deriving the strategic objectives to enhance the strategic alignment of BV assessment, which is also used in ITPM.

2.4.1 A Functional Outcome Based Approach for BV Assessment

To show how this approach can be applied we use applications in the APM context as a case for BV assessment. Each identified information system will be assessed based on how much it contributes to each strategic objective directly or indirectly, like enabling strategic development. The KPIs which are identified for each strategic objective in the BSC can be used to assist the decision about each application's contribution level which will we explained following. To mention that the KPIs are not directly used to assess the applications BV, as they are performance indicators at the strategic level, like percent of graduates' employability, and applications (information systems) can't be directly measured based on them. Moreover, the identified KPIs for a strategic objective do not necessarily fully represent that objective and are rather measurable reflections of it. Considering the case that a strategic objective may be a formative construct and achieving it is not reflected by the identified KPIs, will further disapprove the direct use of KPIs for the applications' evaluation purpose. To make the evaluation of applications we pose the following contribution question.

How well is this application (information system) contributing to the following strategic objective or enabling strategic operations that support this objective? Parameters that can be considered for this decision can include but are not limited to the following:

(a) The application's contribution to KPIs that is relevant to this

strategic objective (the application may enhance or enable the achievement of these KPIs).
(b) The application's contribution to more specific managerial objectives derived from this strategic objective.
(c) Type of information this application provides and its relevance to the strategic objective, or whether this information support that objective (the enabled or enhanced clarity of information originated from the application can be considered too).

To have a quantifiable measure that makes the evaluation of applications comparable against each other we suggest a 5 level scale to be used for replying to the contribution question:
(a) No contribution / this application is irrelevant to this strategic objective = 0.
(b) Shows some usefulness but is not important / its contribution can slightly be seen = 0.25.
(c) Useful contribution / its lack is not worth the enhancements it provides =0.5.
(d) Well contributing to this objective / its lack may introduce some trouble = 0.75.
(e) Efficiently contributing or even mainly intended to support this objective (directly or indirectly)/the lack of this application may endanger the proper achievement of this objective = 1.

Following this method for each application against all strategic objectives will result to a score per each strategic objective. The average mean of the scores of an application against all strategic objectives can be used to apply an overall score to the application. This will be the overall business value score from the outcome-based perspective for that application, see Table 2.1.

Table 2.1 Scoring Applications Against Strategic Objectives To Assess Their Business Value

Strat. Obj Application	Obj 1	Obj 2	…	…	Obj(k)	Overall score

App.1	0	0.75	..	0.25	$= \dfrac{\sum_{i=0}^{K} ObjScore(i)}{K}$
App.2	0.5	0.25	..	0.5	
…					
App.N	1	0.75	..	0.25	

The following points should be mentioned for the above method:

(a) As it is not expected that an applications contributes to all strategic objectives, the problem would arise of how to assign a maximum score. We can use a similar solution as in the process-based perspective; first scoring all the identified applications and summing their scores per objective ($\sum_{i=0}^{K} ObjScore(i)$) also including conceptual ideal applications which have supposedly the highest contribution to BV creation. The highest overall score can be used as the maximum potential score, and the applications overall score determined by dividing their sum-of-scores by this maximum score.

(b) It is also possible that a strategic objective not was being supported by any application; no application having a contribution towards that strategic objective. In this case it should be seen whether that strategic objective is inherently generally irrelevant to applications in the APM context (or to other entities whose BV is being assessed by this method) not only considering existing applications but also potential ones that can have significant contribution to that objective. If there is no relevance between that strategic objective and applications (or entities being assessed), that strategic objective will be omitted from the analysis. Else it shows a strategic objective that needs to be supported by future applications.

If the strategic objectives identified are not all of equal value to the organization they can be weighted based on senior management's view. The weights are applied on each strategic objective and the only difference will be to use the ***weighted average mean*** to set the overall business value score from the

outcome based perspective, see Table 2.2

Table 2.2 Scoring Applications Against Weighted Strategic Objectives, Using Weighted Average Mean

Application Strat. Obj	Obj 1 (W1)	Obj 2 (W2)	…	…	Obj(k) (Weight (k))	Overall score
App.1	0	0.75	..		0.25	$= \dfrac{\sum_{i=0}^{K} ObjScore(i)}{K}$
App.2	0.5	0.25	..		0.5	
…						
App.N	1	0.75	..		0.25	

       The points mentioned above apply here as well with slight changes in the calculations and do not require further explanation.

2.5   PUTTING THE TWO PERSPECTIVE TOGETHER

The result of the business value assessment from the two different perspectives can be used to achieve a final overall result on the BV of an information system (application in the APM context or IT project in the PPM context), but as they are looking at the same thing from different perspectives it is not reasonable to try merging them into each other. Instead the decision can be made based which perspective is more important to the organization regarding its current situation and strategic goals. The outcome-based perspective may show more feasible results in short term but the process-based perspective is necessary for continuous improvement on a long-term basis. The overall BV score can be assigned by attributing appropriate weights to the process-based and outcome-based BV score of an information system after these scores are scaled to a desired, same-scale.

$$Total\ BV\ score$$
$$= (X * process\ based\ BV\ score)$$
$$+ (Y * outcome\ basd\ BV\ score)$$
$$X + Y = 1$$

X and Y are selected based on respective importance weighted to each perspective. For example the values of X=0.3 and Y=0.7 may be chosen in an organization that requires a rather outcome-based orientation toward BV assessment.

2.6   CONCLUSION & DISCUSSION

We presented a multi-perspective view toward business value assessment with a focus on service firms with a non-profit or at least not entirely profit-based orientation. The case of a university in the HE sector is used as a sample organization. The BV assessment can be used for the purpose of APM and/or IT PPM (two parts of the overall ITPM) and is also applicable to other scenarios where the business value assessment of information systems is of interest.

The SVC is presented as a functional approach towards business value assessment from a process-based perspective showing how information systems contribute to the business value creation of services. The methods presented for the quantification of the assessment process may still not well represent the idea itself as the research is ongoing. As an example, the synergy present in the SVC is not seen in the calculations, as the overall business value is conceptually supposed to be higher than the sum of the separate values. The BSC is utilized for the outcome-based perspective to assess the BV of information systems based on their contribution to the strategic objectives. The overall BV is derived from the BV scores of the two outcome-based and process-based BV scores, regarding the organization's preference toward either of these perspectives based on its situation.

To further approve their applicability to real case scenarios,

the functional models need to be precisely reviewed in terms of their input parameters and whether they are formative or reflective measures of the strategic objectives (in the outcome-based perspective) or value-adding elements (in the process-based perspective), to ensure the correctness of the used BV score calculations or revise them as appropriate.

To make the assessment process further objective and decrease the level of subjectivity, more specific and quantified parameters may be derived. Although, this should not inversely affect the models by omitting non-quantifiable parameters in order to reduce subjectivity or introducing quantified parameters that do not correctly reflect the meant constructs. These would be insightful investigations, required in order to conduct surveys based on these BV assessment approaches, which would enable the creation of tools for purposes such as APM or PPM based on these approaches.

REFERENCES

[1]   Jahnke, A., *Why is Business-IT alignment so difficult,* in *CIO Magazine*. 2004.

[2]   Cameron, B., *Business Technology Management Challenges*, in *CIO Magazine*. 2010, IDG Communications.

[3]   Landry, S. and A. Lapkin, *Use gartner's business value model to tackle the perennial problem of business alignment*. 2009, Gartner.

[4]   Expo, G., *Top 10 business and Technology priorities in 2009*. 2009, Gartner.

[5]   McFarlan and F. Warren, *Portfolio approach to information systems.* Harward business review, 1981: p. 142-150.

[6]   Wikipedia. *IT portfolio management*. 2010 [cited 2010 27 february, 2010]; Available from: http://en.wikipedia.org/wiki/IT_portfolio_management.

[7]   Jeffery, M. and I. Leliveld, *Best Practices in IT Portfolio Management.* MIT Sloan Management Review, 2004. **45**.

[8]   Wikipedia. *business value*. 2010 [cited 2010 10 March, 2010]; Available from: http://en.wikipedia.org/wiki/Business_value.

[9]   Cronk, M.C. and E.P. Fitzgerald, *Understanding "IS Business Value": Derivation of Dimensions.* Logistics Information Management, 1999. **12**: p. 40-49.

[10]   John, G.M., G. Vijay, and L.K. Kenneth, *A process oriented framework for assessing the business value of information technology.* SIGMIS Database, 1996. **27**(2): p. 68-81.

[11]   Ward, J. and J. Peppard, *Evaluating IS/IT investments*, in *Strategic Planning for Information Systems*. 2002, John Wiley & Sons. p. 422-436.

[12]   Anderson, F., *Application Portfolio Management*. 2006, The Manta Group.

[13]   Brown, M.G., *Problems with most scorecards today: The new Top 10 list*, in *Beyond the Balanced Scorecard*. 2007, Productivity Press. p. 8-17.

[14]   Melville, N., K.L. Kraemer, and V. Gurbaxani, *Information Technology and Organizational Performance: An Integrative Model of IT Business Value.* MIS Quarterly, 2004. **28**(2).

[15]   Porter, M., *Competitive Advantage: Creating and Sustaining Superior Performance*. 1985, New York: Free Press.

[16]   Stabell, C.B. and O.D. Fjeldstad, *Configuring value for competitive advantage: on chains, shops, and networks.* Strategic Management Journal, 1998. **19**: p. 413-437.

[17]   Buhn, M. and D. Georgi, *Services Marketing: managing the service value chain*. 2006: Harlow, England: Financial Times/Prentice Hall.

[18]   Buhn, M. and D. Georgi, *Framework of value-oriented services marketing*. 2006, Harlow, England: Financial Times/Prentice Hall.

[19]   Lowendahl, J.-M., M. Zastrocky, and M. Harris, *Financial Slowdown Emphasizes Budget-Planning Effectiveness in Higher Education: But It's About Yield, Not Cost*. 2008, Gartner.

[20] Duggan, J. and B. Malik, *Defining 'Application' for APM*. 2009, Gartner.

[21] Kaplan, R.S. and D.P. Norton, *The balanced scorecard : translating strategy into action*. 1996, Boston, Massachusetts: Harvard Business School Press.

[22] Kaplan, R.S. and D.P. Norton, *The strategy-focused organization: How balanced scorecard companies thrive in the new business environment*. 2001, Boston, Massachusetts: Harvard Business School Press.

[23] Niven, P.R., *Performance measurement in the public and nonprofit sectors*, in *Balanced scorecard step-by-step for government and nonprofit agencies*. 2008, John Wiley & Sons. p. 26-31.

[24] Niven, P.R., *The rise of intangible assets in value creation*, in *Balanced scorecard step-by-step for government and nonprofit agencies*. 2008, John Wiley & Sons. p. 3-11.