Cybernetic Approach in Building the ICT Project Business Case

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***Abstract*—ICT Projects complexity makes their business case an NP-complete problem. Yet, the necessity of business planning demands at least certain approximations. The first, second and third order cybernetic approach with feedbacks on each levels is considered to deliver the best available budget estimation with the highest available confidence level, which still improve with the progress of the budget elaboration and later in the project course. Deployment example from international concern and main national ICT market player illustrates the usability of the presented approach.**

Keywords; third order cybernetics, ICT business case, ICT complexity, ISO21500:2012, WTO/GPA, COCOMO II

I. INTRODUCTION

Non-profit organization and individual persons dispose about their wealth under any criterion. All other organizations have to justify their endeavours towards their shareholders; in a direct or implicit way: family member towards his closest, company management to capital lenders.

Obviously the secret spending can not be omitted; however, it remains in certain relation as a small percentage of the overall budget. Otherwise it gets exposed and instantly submitted to the rigid evaluation of the stake holders.

This paper focuses on the success factors of the decision taking process in which the shareholder companies evaluate, whether to engage in a project or not.

The shareholder is a person or organization lending capital to finance an enterprise. The company is any individual or more or less formally bound group of persons with common business goal and both cases represented by the company management.

The analysis of the motivation to engage the capital leads to three cases:

- Past investments have to be capitalized.
- Current free resources for whatever reason can not be released and has to be deployed.
- Prospective returns on investment are attractive to the company. This includes the intangible and at first glance social or beneficial projects of shareholder companies.

In each case the decision has financial background: to capitalise the past, present and future investment in a way, which is satisfactory to the share holders. Call it profit and profit oriented company.

Profit oriented company is not to be perceived pejoratively. It is the legitimacy of a company management towards its shareholder to engage the capital in a profitable way, whatever the shareholders define as profit.

This lead us to the two success factors of an engagement of a profit oriented company in a project:

Precision of the project budget elaboration.

Confidence level of the elaborated budget prospective.

Particular cases are the ICT projects. Their marketing effort, which depends on product and market novelty relationship, can be still roughly estimated. More difficult is the ICT product cost estimation. Even the simplest ICT task contains multiple decisions. The task can be solved in various ways. This unpredictability firstly regarding the task understanding = objective specifications, and secondly - regarding the solution, make them complex and thus difficult to evaluate. Numerous researches and widely known practice examples exposes the same poor performance of both project budget precision as well as managers ability to assess the confidence level over the decades [1],[2],[3],[4],[5],[6].

The cybernetic approach, presented hereafter, contributes to the mitigation of the ICT project budget precision and increases its confidence level. Business examples from the practice of a major player on the ICT market illustrate the successful application of this approach.

II. ICT BUSINESS CASE CHALLENGE

Traditionally, a business case is defined as a document presented to management to win commitment for an investment in proposed project [7]. The main goal of building the business case for an ICT project is to obtain funding approval for the financial spend [8]. M.J. Schmidt proposed to use business case not only for predict the likely financial results but also to other business consequences of an action or decision [9], which shall indirectly contribute to the financial gains for the company in the future. J. Ward, E. Daniel, J. Peppard, includes in Business Case also the prioritization of the different investments, assessment of the benefits, created in cooperation between IT and business changes, and commitment of the company management to achieve the intended investment benefits [8].

We recognise, that ICT project business case gains in the complexity irrespectively if it concerns the known or new market, existing or yet to be developed product. Gell-Mann [10] defines the complexity by the length of the object description. Complexity is between the order and disorder.

Even the most innovative and sophisticated issues, if they can be ordered (like e.g. $e=mc^2$) become simple: short description and easy handling. On the other verge is complete disorder, with no rules, what again makes it simple to describe.

A. Market Assessment Complexity

Known Market for already existing products in Ansoff-Matrix may be relatively well described, even if this description might be of considerable length, thus growing complexity [11]. If this effort may be estimated as 1, the market development requires already a quadruple effort due to the unknown behaviours and higher initial product acceptance barrier of the new users unfamiliar with the offered product. An effort increases to eightfold for new products on the existing market as the intensified relationship with the customers is needed [12].

The most intense market effort (sixteenfold), the highest complexity from the point of view of the company, and the highest uncertainty, thus lowest confidence, is associated with market diversification [12], [13], [14].

B. ICT Product Assessment Complexity

ICT products, due to the enormous number of possible combinations between the project objectives and selected solutions, become complex even in the simplest case.

R. Wysocki classifies projects along the degree of the clarity of the project objectives and project solutions [15].

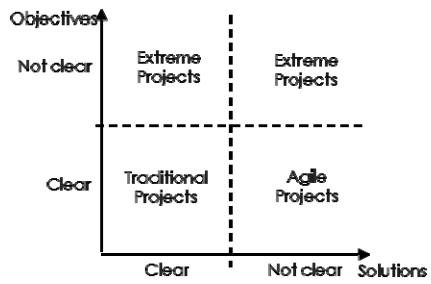

Figure 1. Objectives/Solutions taxonomy of R. Wysocki [15].

"Traditional" projects with clear objectives and clear solutions (products) includes "Low-Tech", "Mid-Tech" and "High-Tech" projects as classified by Shenhar and Dvir [13] with increasing complexity of description and decreasing confidence level of cost estimations.

Projects, with clear objectives and unclear solutions, which might be identified as "Super High-Tech" in Shenhar and Dvir classification [13], are best structured as agile project, at the expense of cost and objectives stability.

The "Extreme Projects" aims at finding new application areas for available solutions. Also here the costs and time are variables. It corresponds with the market development, where new markets for existing products are sought, shifting the complexity issue towards business market aspects.

The extreme projects target the goals with unclear objectives and unknown solutions. The description evolves here with the project development. We reach here the NP-complete problem of business case assessment.

An increase in the objectives and in the technological novelty results also in higher risk, uncertainty of achieving the targeted objectives and unpredictability of the final product stability [16], [17]. An issue is thus to assess the costs with the highest possible accuracy and to handle the risks to minimise an impact on confidentiality of the elaborated business case.

C. ICT Project cost estimation

General method in the assessment of the ICT project costs bases on two approaches:

Top-down (Process 4.3.25 Develop Costs acc. to ISO 21500:2012 [18]). The estimations usually base on some reference models and thus contribute to the completeness of the considered costs [19]. These estimations are frequently called ROM: Rough Order of Magnitude, or Ballpark Estimate, and may deviate from the final costs by 50-100% [20].

Bottom-up (Process 4.3.26 Develop Budget [18]), where both tangible direct and indirect as well as intangible costs are included and an approximation of +/-20% is sought.

The analysis of 200 projects done by HP in the early 1990 identified poor project cost estimation as the second major reason of massive costs overrun [21].

An effort in cost estimation shall be in some relation to the total costs under consideration and the associated risks.

Small projects, where project manager or someone, who conceive the endeavour feel competent, can be with reasonable reliability estimated by that person. However, with the increasing complexity the reliability of the estimation is decreasing.

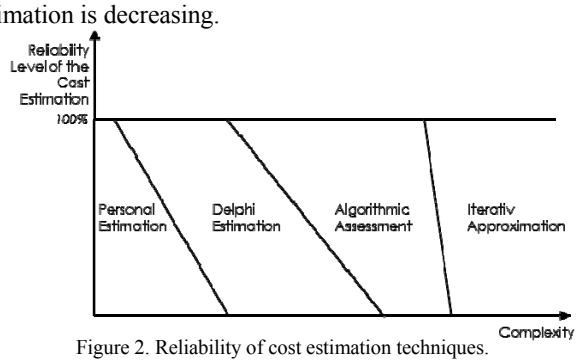

Figure 2. Reliability of cost estimation techniques.

Within certain block ("Low-Tech", "Medium-Tech") Delphi procedure may be used [22]. In more complex cases the algorithmic assessment like COCOMO II [23] or Putnam Myers Estimations [24] might be in place. In 68% of cases, the deviation of budget and real costs was less than 20% [25], including the impact of the human factor (Sackman's Second Law, [26]).

In the most complex projects with NP-complete characteristics ("Super-High-Tech" and "Extreme Projects" only iterative approach might be successful.

Several techniques, preferred according to Graham and Harvey survey of 392 CFOs [27] are thoroughly presented in [28].

III. CYBERNETIC APPROACH TO THE ICT PROJECT BUSINESS CASE ELABORATION

A. *First, second and third order cybernetics*

The iterative approach presented in this paper origin from Wiener cybernetics after the Greek steersman (χυβερνήτης) [29]. The general model of cybernetic system with feedback through the environment is depicted in Fig. 3.

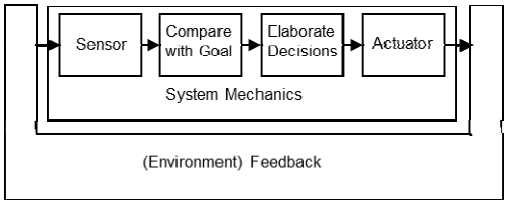

Figure 3. General cybernetic model.

Complex systems, treated by Wiener cybernetics do not lock into stable state but also do not dissolve in chaos. The non-linear nature exposes high sensitivity to the initial conditions and multiple equilibriums. In effect a finite models of dynamic systems are limited in their predictability leading to the unavoidable imprecision. Predictability is bound to the probability in such systems [30]. Yet, the short term predictability is nevertheless feasible [31] so it makes sense to try to exercise the business case elaboration by applying the cybernetic theory rules.

Von Foerster introduced 1974 the second order feedback loop: his observer (the system mechanics in the Fig. 3 is a cybernetic system with own loop itself [32]. By deploying a number of such second order cybernetic systems we attempt to view our first order system through the filter of particular second order sensors.

The person elaborating the business case itself is the Von Foerster Observer (third level loop) in this second level project management processes' loop.

B. *Feedback in Typical Procurement Processes*

Feedbacks in Business Case Elaboration depend on the feasible relationship between the seller and the buyer.

1) WTO/GPA Procurement. About 30 countries, of the WTO signatories, signed the Agreement on Government Procurement GPA, which regulates the process contract award. ISO 21500:2012 implements this in three processes [28]. Buyer elaborates one-sided the technical specifications (Fig. 4)

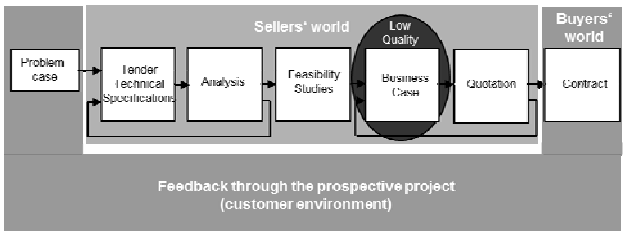

Figure 4. WTO GPA conform procurement process.

Seller has here only limited possibility to influence the technical specifications during the bidding phase. His analysis, feasibility study and business case are thus limited in quality, increasing the inaccuracy of estimation and risks. Consultants deployed by the buyer in the problem elaboration and technical specifications have limited impact on quality of the business case.

2) Objective-Solution Oriented Approach. Here the seller is involved in the analysis of the objectives as well as in the draft of possible technical solution. Subsequent tender technical specifications expose higher quality leading to the higher quality of the business case. Numerous feedback loops contribute to the quality improvements (Fig. 5).

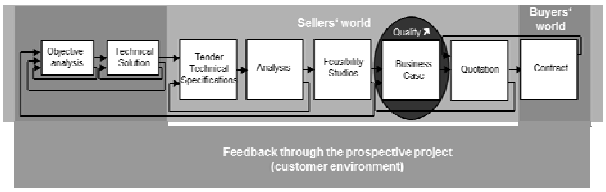

Figure 5. Best practice example of buyer's objective oriented relationship between buyer and a bidder.

3) Seller Oriented Approach. In the Seller Oriented Approach the business interests of sellers' company dominates the process. The Objective-Solution Oriented Approach is supplemented with a forehead evaluation of the business potential (see Fig 6). The objective-technical solution iterations are embedded in project acquisition, whereas the analysis, feasibility and business case are part of project qualification.

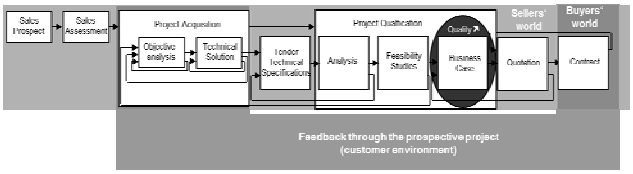

Figure 6. Best practice example of buyer's problem oriented relationship between buyer and a bidder in seller oriented approach.

IV. PRAXIS

Major stock exchange listed telecom company, part of the world wide operating ICT corporation, faced in 2008 challenges on the market, which stipulated efforts to improve the efficiency of the business acquisition.

The customers' perception of the company as the former state owned company handicapped the possibility to implement the Objective-Solution oriented approach.

The telecom company developed the Seller oriented approach with strong focus on b2b business relationship development, targeted in strategic sale and deployment of specific company capabilities (sales prospect and potential assessment). Objective analysis and technical solution elaboration are embedded into the company driven project acquisition process based on modified SPIN model [33]. The feedback loops has been applied as frequently as necessary.

Already after the first 12 months of applying the above described approach an increase has been registered in the following areas:

- The business development, defined as number of predefined prospects in relation to the number of ongoing projects ,
- Number of the acquired ICT contracts,
- The effectiveness of the acquisition, expressed by a number of predefined prospects in relation to the number of completed projects ,
- The value (potential revenue) and number of projects prospects .

V. CONCLUSIONS

Conscious feedbacks of first, second and third order cybernetics reduce the complexity by partitioning the task into smaller units with less variables and better quality of objective-solution identification. An analysis of limited combinations allows for deployment of specific tools increase the probability of better estimation of the subjects under consideration. Improved quality of business case with higher degree of confidentiality contributes positively to project perspectives and finally the overall business success.

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