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Published in:
[Host publication title missing]

2003

[final pre-publication version] Bednar P. M. & C. Adams (2003). Evaluation processes: Lessons from Bateson's second order learning. ECITE 2003. Proceedings of the 10th European Conference on Information Technology Evaluation. Instituto de Empresa, Madrid Spain, 25-26 September 2003. ISBN: 0-9544577-3-0.

Evaluation processes: lessons from Bateson's second order learning

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Abstract

This paper focuses on learning and reflection in evaluation processes. The needs and focus of evaluation change over the life of an Information System (IS) project. Evaluation does not necessarily always equal analysis, however, a meaningful evaluation can only be done if combined with analysis of the context. Evaluation processes must include some learning element to be contextually relevant. To understand evaluation processes, particularly learning processes, we draw upon Gregory Bateson's (1972) framework of multiple orders of learning. An example of an initial framework for supporting different levels of learning in IS evaluation is presented.

Introduction

This paper examines learning and reflection in the evaluation processes for Information Systems (IS) projects. It argues that the needs and focus of evaluation change over the life of an Information System (IS) project. Evaluation does not necessarily always equal analysis. As we see it, analysis is an inquiry into the *unknown*, whereas evaluation is a judgement making activity (putting value upon) of something assumed to be *known* and understood well enough to be valued. This means that an evaluation is where we set values based upon our 'prejudices'. Looked upon in this way it becomes clear that a meaningful evaluation can only be done if combined with analysis.

Evaluation is a continual process; from pre-project, through development and post implementation. At the start of a project the evaluation may be concerned with the economic potential, whether the system addresses set stakeholder needs, business or other requirements etc. During and at the end of a project, when a more developed understanding of system requirements progresses and core challenges are assumed to be known, the evaluation may be more concerned with whether the system meets a different and changing set of needs, possibly concerning different and changing stakeholders, or a different business environment than originally. Evaluation is effectively promoted here as an ongoing re-evaluation and forms an integral part of continuous development processes.

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The focus, challenges and benefits of a project will evolve over time. Consequently, the evaluation of such an IS project should also develop over time. Further, there is a need to learn from past evaluation activity so that evaluation errors are not repeated. To understand and support required dynamic learning processes in Information Systems evaluation we draw upon a re-interpreted version of Gregory Bateson's (1972) framework of multiple orders of learning as an integral part of contextual analysis.

Bateson's original concepts (especially those of first and second order learning) and to some degree double loop learning (as described by Argyris and Schon, 1978, 1996) continue to be very relevant to contemporary IS analysis and evaluation activity. Furthermore, analysis and evaluation activities are contextually dependent processes, consequently re-evaluation processes are also contextually dependent. Being critically aware of evaluation processes may offer scope for learning and so improving upon evaluation activity.

This paper first examines evaluation dynamics surrounding IS projects development and use, so building the case for a contextual analysis as part of the evaluation process. The paper then draws upon Bateson's order of learning and applies it to IS evaluation activity. Examples of zero, 1st (I) and 2nd (II) order learning are given. The learning of second order exemplified within a framework of contextual analysis. This provides guidance on learning and developing a systemic process of evaluation in action. Contextual analysis is in turn based upon inquiries into multiple levels of contextual dependencies (Bednar, 2000). The aim is to reduce evaluation errors and focus on contextual relevance, this requires learning from previous evaluation activity, understanding context and being reflective on process.

Evaluation Dynamics: Evaluation as an evolving, learning system

It is contended that the needs and focus of evaluation change over the life of an Information System (IS) project from initial project identification, throughout implementation to post implementation activity. Evaluation, like most other aspects of development, is not a static activity. This is identified by Sauer (1993) who refers to the fluid nature of information systems development processes, in which a final system may vary considerably from its initial conception: *'an information system is an organisational resource the responsibility and control for which can shift over time. Different groups can be involved in the innovative process at different times, each trying to make it an effective resource for them. As interests and stakeholder groups change, so the characteristics of the system may be adjusted accordingly.' (*Sauer 1993, *p12).* The picture painted here is one of a dynamic process with evolving requirements and needs, as well as changing stakeholder groups and dynamics. To evaluate, make some form of judgement, or putting value upon such an IS will also require some element of 'evolving': clearly, evaluation of such an IS will require some changing evaluation focus.

This is confirmed when we examine other works on information systems and computer failure. The earlier works (i.e. those of the 1970s and early 1980s) dealing specifically with computer failure, tended to address mostly technical issues (e.g. Martin 1976; Meek

and Heath 1981). Later works (i.e. the mid 1980s onwards) start to address management, organizational and social issues and attempt to consider the effect of different interested parties, or 'stakeholders'. One of the most comprehensive of these works, and collated many of the works at the time, was by Lyytinen and Hirschheim (1987) who identified four major categories as follows:-

> 1) Correspondence failure (i.e. the information systems does not meet the stated design objectives).
> 2) Process failure (i.e. the information systems is not produced within given time or budget, and includes situations where no workable information system is produced). This is largely related to process management problems and controlling of resources.
> 3) Interaction failure (i.e. the interaction of the information system by the end-user, where a low level of use can be classed as a failure).
> 4) Expectation failure (i.e. where the information system does not meet the expectations of one or more of the stakeholder groups).

Lyytinen and Hirschheim stated that the first three categories '*constitute special instances of an expectation failure, reflecting specific interests of a powerful stakeholder*'. They defined computer failure as the inability of an information system to meet a specific stakeholder group's expectations. Lyytinen and Hirschheim argued that '*there is a lack of any detailed treatment of the notion of what precisely is meant by "failure" and what is meant by "success"'*. The notion of success or failure can be viewed as dynamic over time, as Connell and Powell (1992) point out '*It is not clear what constitutes success, how success should be measured, nor if success criteria are stable over time and between projects*'. A system in the 1980s will have been measured against a different set of criteria to a similar system in the 1990s. It is useful to note an analogy with the early studies on employee needs and motivation, and with Maslow's hierarchy of needs, which show that individuals and groups have their own hierarchy of importance and that as soon as one set of needs is satisfied another set becomes important. Equally then, when one evaluates an IS one is likely to have a corresponding 'hierarchy' of evaluation elements and attributes. Further, other studies show that criteria for positive influences at work are different to negative influences (Herzberg 1966). Following this theme, it is likely that evaluation criteria for an information system success will be different to the evaluation criteria for an information system failure

These works indicate that evaluating the success or failure of an information system is open to considerable interpretation and is likely to be viewed differently by various interested parties or stakeholders at distinct times. For evaluation to make any meaningful sense it has to be considered in context: Meaningful evaluation requires some an advanced form of contextual analysis. The focus, challenges and benefits of a project will evolve over time and consequently, the evaluation of such an IS project should also develop over time. Meaningful evaluation, then, must be a *process*. Evaluation activity has to address a changing context as well as learn from previous evaluation activity so that previous errors are not repeated. Furthermore this 'changing context' is a misnomer since it is a kind of contextual pluralism at several levels, not only in time and space but

also within a hierarchy of different logical types. To understand and support this dynamic learning processes in Information Systems evaluation we draw upon a re-interpreted version of Gregory Bateson's (1972) framework of multiple orders of learning as an integral part of contextual analysis.

Bateson's Framework

Bateson (1972) provides a cognitive tool for examining evaluation processes in the form of a hierarchy describing different levels (orders of logical types) of learning. Bateson argues that information can be defined as a difference that makes a difference and also that such information only exists in relation to a mental process. Without a mental process there is no information.

In this section we will bring out the main characteristics of these different levels of learning and then apply them to evaluation activity.

Zero learning, according to Bateson, represents no change in learning. The same criteria will be used over and over again with no thought to the appropriateness of the criteria to the current context. Interestingly enough this is the same kind of learning often experienced in schools and other 'learning' environment, it is then also recognizable under the label of 'product' oriented learning (as opposed to 'process' oriented learning). Further, the same stimuli (assumed to be contextually independent) will produce the same results (which is the main point of 'product' oriented learning), even if previous activity could have shown the criteria to be deficient due to context. So zero learning has no process for correcting errors. For us, drawing upon Bateson, the *process* of learning becomes important since the type of learning process activity indicates the type of errors that can be corrected:

"*If we now accept the overall notion that all learning (other than Zero learning) is in some degree stochastic (ie contains components of trial and error), it follows that an ordering of the process of learning can be built upon a hierarchic classification of the type of error which are to be corrected in the various learning processes.*" (Bateson 1972, p287)

Level I learning, according to Bateson, is used to represent some revision activity where a revision takes place using a set of alternatives. This assumes a repeatable context, but that people have 'learnt' from previous stimulus.

Level II learning, according to Bateson, is used to represent some revision based on revision of the context. Understanding and learning from the context and how the context changes is likely to correspond to level II learning. Bateson takes the concept further by defining level III and IV order learning based on understanding further context of context:

"*stimulus is an elementary signal, internal or external … Context of stimulus is a meta message which classifies the elementary signal. Context of context of stimulus is a meta-meta-message which classifies the meta-message. And so on*." (Bateson 1972, p289)

However, Bateson identifies that this would require almost omnipotent capabilities. Level III and above become less useful for evaluation purposes (the context of the context of the context or, meta-meta-meta-message is difficult to comprehend, never mind apply!).

Examples of IS evaluation Level 0 learning

This would equate to using the same evaluation criteria at the start and end of a project, and importantly, using the same criteria in the next project, without any learning activity being undertaken. It may even be following 'best practice *recipes*' of evaluation criteria. However, the criteria do not change, even from project to project. No learning has taken place with the application of the evaluation criteria.

A similar theme was identified by Wastell (1996,1999) who also examined learning activities in a development environment, though his focus was on development techniques. Wastell uses two concepts which describe learning support behaviour: 'social defence' (Menzies-Lyth 1988) against the unknown and 'transitional objects and space'. Wastell's later work focuses on the learning activities developers need to undertake to ensure a successful development (i.e. finding out about the requirements/problems the system is to address).

> '*We argue that the operation of these defences can come to paralyze the learning processes that are critical to effective IS development. … These* ***social defences*** *refer to modes of group behaviour that operate primarily to reduce anxiety, rather than reflecting genuine engagement with the task at hand*.' and '[Transitional] *spaces have two important aspects: a supportive psychological climate and a supply of appropriate* ***transitional objects*** *(i.e. entities that provide a temporary emotional support)*. (Wastell 1999,p3)

The social defences concept is used to describe how developers follow methods, techniques and other rituals of development, as a means to cope with the stresses and uncertainties of the development environment (Wastell and Newman 1993). Thus 'blindly' following of the rules of the methods and techniques can become paramount against addressing the 'real' problems of development.

But even if social defences, mental and cultural difficulties were to be overcome within the evaluation process there is no 'naturally' occurring correction of errors. This lack of correction may not always be recognized as a problem especially if the results of an evaluation activity are not used (it may not be noticed that an evaluation was inappropriate). Patton (1987) for example states that a major challenge in evaluation activity is not only to uncover relevant information but also to get people to act upon it (instead of just create another report for the bookshelf no-one can be bothered with to use

as a source for implementation of change). No matter how good a solution may be – if it is not applied it remains a theoretical possibility, or prose in other words.

Such situations represent level 0 learning activity. One might say that it is keeping the evaluation 'prejudices' from project to project.

Examples of IS evaluation level I learning

This would equate to some development activity in producing and applying evaluation criteria for a project. It may involve using the same criteria at the start of different projects, but may result in different evaluation decisions for the same set of stimulus: there has been some learning from previous projects and experiences. It may also include some development of criteria, possibly even following 'best practice *processes*' which include contextual development of evaluation criteria. It incorporates re-evaluation of criteria. Some learning has taken place with the application of the evaluation criteria.

When it comes to the evaluation process this could also for example mean that a certain 'best practice' might be exchanged with another 'best practice' (out of a set of alternative best practices for evaluation). The evaluation process is not re-evaluated itself in relation to the contextual dependencies of the evaluation activities.

Such situations represent level I learning activity. One might say that it is changing the evaluation 'prejudices' for a different set of 'prejudices'. The result is that, hopefully, previous evaluation criteria errors will not be repeated.

Examples of IS evaluation level II learning

This would equate to reflection on evaluation criteria development and application processes. It would include reflecting on 'best practice processes', considering the context of the context of the processes and considering alternative sets of processes. It involves considering how the evaluation criteria are developed and applied within a particular dynamic context. Learning about processes and particularities has taken place.

Such situations represent level II learning activity. One might say that it is finding, reflecting and rethinking evaluation 'prejudices' (what is relevant to evaluate, how, why and in relation to what kind of context etc). The result may still be some evaluation 'prejudices', however, they are from a different domain set of 'prejudices'. The result is that, hopefully, previous evaluation process errors will not be repeated. If errors are repeated, or if new errors are introduced, a more developed and mature understanding of recognized errors should help to raise the assessment of the contextual relevance of the resulting evaluation. The result being, hopefully, a better quality of knowledgebase for decision making activities.

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Contextual Analysis and Evaluation

In this section we show an example of a framework, which might be used to support a creation of a systemic process, which could include learning at multiple levels (based upon different orders of logical types as introduced by Bateson). The framework presented below is intended as a simplified example of a pragmatic approach and introduction to an application of learning at different levels. The concept of inquiries into multiple levels of contextual dependencies has been used by Bednar to describe efforts to integrate individual and organizational learning perspectives as an inherent part of IS analysis. Such an analysis process is promoted as a dynamic set of (hierarchic) learning processes, which include evaluation (Bednar, 2000; Bednar and Bissett, 2001). The idea is to integrate particular individuals inclusive related particular contextual dependencies in multiple levels of learning processes based upon different orders of logical types. A practically workable example of such inquiries was presented by Bednar (2000) as a framework for Strategic Systemic Thinking (SST). As a *strategic* framework it requires an active participation of relevant stakeholders. For example, it would not be recommended that practical application of SST should be delegated in such a way that it excludes key decision makers. It is not to be expected that delegation of learning would result in the same kind of learning for those who delegate as for those who are delegated to.

The SST framework includes three major parts where each part has support for multiple levels of learning processes (mainly of Zero order, First order and Second order). All the parts together create a learning spiral, which may support a learning process of third logical order, but realistically we are currently more inclined to believe that this kind (of Third order) of learning will be very difficult to achieve (if at all). What might hopefully be reached (at best) would be a learning process of a logical order outside of the presented hierarchy, or parallel to the second order (2,5 as Bateson described his own efforts and discussions related to the second order).

Each of the three parts of the SST framework has four sections. Each section has a primary *carrier* for an inquiry and a secondary for a reflection of a different order, which is labelled as 'dynamics'. There are other *carriers* but those are outside the scope of this paper. The reason for the different *carriers* is to assist any user in the separation of processes of different logical order. A rough description follows; (see Bednar, 2000; Bednar and Bissett 2001 for more detail):

Analysis A: Individual analysis which is an 'intra-individual' analysis.

i) The focus is on the particularities of the *situation*, competence and personal context (**what**, **where** etc). The dynamics here are focusing upon reflection of possibilities, conclusions (e.g. **'why?'**).
ii) What is the main *target* and the related particularities (**aims**, **goals** etc.). Dynamics are looking into acceptance and questioning assumptions of acceptance in context (**what** from an observers point of view etc.).

iii) Particularities of the *vehicle*; background, expectations, possibilities etc (e.g. **why** are these expectations?). Dynamics are inquiring into possibilities and needs (**what**, **how, why?** Etc.).

iv) Any possible *road* that might be used so that a goal may be achieved (e.g. **how?**). Dynamics consider strategies (changes, trust, approaches etc.).

Analysis B: Group analysis (also called analysis of individual span) is an 'inter-individual' analysis.

i) *Grouping of worldviews*; what are the particularities of recognizable worldviews at levels of team, group, organization, society (commons *vs*. extremes etc.). Dynamics support alternative stakeholders and participants (difference of mental constructs, etc).

ii) *Maps of existing situations;* overview of available 'knowledge' related to introduced worldviews (tools, resources etc.). Dynamics focus on assumptions of resources and mental constructs (experience, skill sets, etc).

iii) *Desired future situation*; descriptions related to presented worldviews (orientations, aims). Dynamics refer to reflection over 'truths' of perceived solution sets (why?).

iv) *Alternative roads*; an inquiry into alternative and competitive goals related to worldviews (aims, solutions and political feasability). Dynamics focus upon re-evaluation of assumptions related to mental constructs (why?).

Evaluation C: Evaluation of analysis processes.

i) *Constructive what if*; an inquiry into the particular understandings of truths and realities. Dynamics look at possible plural contextually valid realities including incompatible ones (temporalities, politics, etc.).

ii) *Constructive and positive criticism;* a referal to underestimation of future local benefits. Dynamics look at systematic effects and related impact to whole (particular referential frameworks and a relation to subsystems and super-systems).

iii) *Constructive and negative criticism*; a referal to overestimation of future local benefits. Dynamics look at systematic effects and related impacts to whole (particular referential framework and relation to subsystems and super-systems).

iv) *Competence*; a referal to aspect blindness due to pre-understandings (knowledge, habits, culture, etc). Dynamics focus upon re-evaluation of personal worldviews as limiting factors of analysis process (perspectives, recognitions, etc).

The main parts in SST framework are described with the labels Analysis A, Analysis B and Evaluation C. These parts (A, B, C) are not to be understood as 'steps' which should be executed in any particular order. The labels are intended to be used to separate the parts from each other, not for ordering them. Our experiences show that the parts can be

used in any order and as many times as necessary according to each particular situation or 'project'.

It is also our experience that professionals are usually already familiar with a range of analytical 'tools' (methods or techniques etc) in their current organisational environments. Several of these locally known tools can often be beneficial to any part in the SST framework. Examples of such tools that can be meaningful to apply are 'Rich Pictures' (e.g. Checkland, 1981), different methods for mindmapping, brainstorming etc. What these kind of tools have in common is that they are meant to assist the user in visualisation, creation and re-creation (or discovery and re-discovery) processes, expanding 'understanding' through systemic feedback loops. Raising awareness through explicit communication with others and self.

Concluding thoughts

IS projects have to contend with highly volatile development and use environments, typically involving a changing focus for requirements as well as changing stakeholder dynamics. Within this dynamic environment it is easy (and according to the computer failure literature, seemingly common) for past evaluation errors to be repeated. Evaluation within such complex environments requires some learning activity to take place so than past errors are not repeated and that the changing focus and context of the particular IS (which is focused upon) is recognized.

One recurring theme and intention behind efforts presented in this paper can also be summarised with two points. a) A call for necessary involvement of key stakeholders in analysis and evaluation activity processes, and b) to challenge common-sense based assumptions of utility tests and truths, made by stakeholders, evaluators, analysts etc. Meaningful and effective IS evaluation activity requires something similar to Bateson's level I and level II learning to take place. This requires some contextual analysis, to understand, develop and apply evaluation criteria to specific contextual needs. It will also require some reflection on actual evaluation processes, ensuring the processes are appropriate for the relevant contexts.

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