

Cause-and-Effect Analysis in the Organizational Engineering Processes of the G.O.D. Organization

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Abstract. Nowadays, enterprises are an intricate web and this complexity frequently originates inefficiencies that commonly turn into the loss of resources and might even compromise organizations' viability. Change is a recurrent necessity, but enterprises have reported to struggle and often fail when implementing the needed organizational change processes. Change processes under the G.O.D. Organization often reveal to fail to eliminate or circumvent the cause of the exception. Based in the seven guidelines for Information System Research in the design-science paradigm, we argue that the organizational engineering process should be complemented with a more systematic and broader investigation of causes, namely by using the Ishikawa approach of cause-and-effect analysis. The main contribution of this paper is in the improvement of the organizational engineering processes for the handling of unexpected exceptions in reactive change dynamics, which should help to reduce recurrent dysfunctions and keep updated the organizational self and the organization's ontological model.

Keywords: Dysfunction, Enterprise engineering, G.O.D. Organization, Unexpected exception, Organizational engineering.

1 Introduction & Related work

There is a constant demand to have more effective enterprises [1], as workers spend a significant amount of time handling unexpected exceptions (problems) that cause dysfunctions (incidents) [2, 3]. The handling of and recovering from exceptions are pricey processes [3, 4] and may even compromise enterprise's viability if there is a lack of a timely and adequate response [2, 5, 6]. Organizations try to minimize the occurrence of exceptions by better structuring their internal procedures. If the organization misses to capture the reactive change dynamics and insert it in its reality and ontological model, the organization will be less aware of itself and less prepared to deal with change over time [5], leading to organizational inefficiencies.

DEMO (Design & Engineering Methodology for Organizations) is a recent tool that helps to harness the intricate knot that organizations have become to easily fix design/analysis mistakes [2, 6]. The Control Organization (CO) [2] and the G.O.D.

Organization (GO; generation, operationalization and discontinuation organization) [2] handle the dynamics of reactive change and allow the modeling of the function perspective of an organization as a DEMO based design artifact [2, 5, 6]. The GO implements microgenesis strategies by initiating organizational engineering processes (OEP) [2, 5] which acts in the case of an unexpected exception, by monitoring, diagnosing and defining recovery actions [2]. To accurately detect the root cause, actors need to do a detailed assessment of the dysfunction and exception [7], in the diagnosis phase of the OEP. Once the cause is identified and the actions are defined, the GO will generate, operationalize and/or discontinue a certain bundle of organization artifacts (OA) to eliminate or circumvent the unexpected exception [2], which preserves an updated organizational self and ontological model [2]. However, the methodology to detect the exception kind is not defined in the published work [2]. Other researchers have focused solely on promptly identifying recovery actions to eliminate or circumvent the dysfunction, not its cause [7]. In the GO, the choice of cause and the choice of solution are qualitatively evaluated in the Dysfunctions Diagnosis and Actions Table, but the criteria for this evaluation is also not clear in the model.

Determining why a system is performing poorly is a key task, but is also one of the major challenges posed by unstructured systems [8]. The complexity to detect the cause might be related to the fact that a single cause can have multiple effects and an effect can also have various causes [9]. Discovering the root cause is to identify where effective action can be taken to prevent dysfunction recurrence [8]. The literature presents different frameworks to analyze root causes of exceptions [8–10], but the cause-and-effect methodology (CEM) by Ishikawa is one of the most popular ones [10]. CEM is a problem-solving tool that helps to systematically investigate all the potential or real causes that result in an exception [9, 10]. CEM clusters causes by categories, contributing to a more structured and broader analysis [10]. However, CEM does not conveniently represent the interrelations among different causes and does not differentiate the strength of various origins [10]. The CEM is usually pictured with four to six main categories of causes [10] (see Fig. 1). CEM starts by identifying the problem [10] and then suggests to do a brainstorm to find the exception kind. At this stage is important to keep asking, in a string of questions and answers, “why did this happen” until identifying where effective action can be taken to prevent that exception to occur again [8]. After determining the main causes, actors need to cluster them into categories and plan the deployment of the necessary actions to eliminate or circumvent the exception [8].

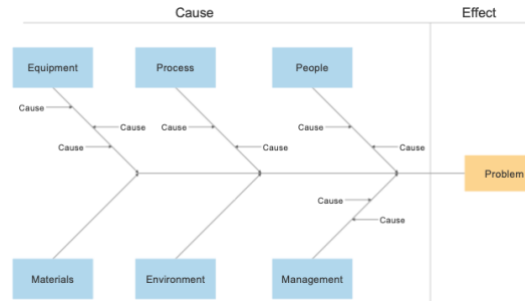


Fig. 1. Example of a cause-and-effect diagram

We believe that considerable benefits may arise from the addition of a systematic and broader investigation of causes, including the reduction of organizational dysfunctions and inefficiencies. This approach should reduce the reoccurrence of past malfunctions and, by dealing with a wider array of causes, should also prevent new dysfunctions from occurring. In this paper, we present a proposal to include CEM in the OEP in the GO, for handling unexpected exceptions in reactive change dynamics. In the development of this model, we applied the seven guidelines for Information System Research in the design-science paradigm by Hevner [11].

2 Addition of the CEM to the OEP in the GO

Considering previous works, our approach sets the procedure for the exception kind detection as an iterative process, where different actors can collaborate and actively contribute with their expertise and competencies [7, 10]. In this stage, the experience and records play important roles in the accurate understanding of the situation and in the detection of causes. As singular causality can be utopic [9], our approach entices actors to look for different causes (that can be real or potential) and then cluster those causes. We aim to have a model that is accessible by any enterprise and, therefore, our approach does not establish standard categories, we leave the categories to be defined within each organization. Our model can be applied either to reactive change or to proactive change processes.

We have updated the model of the GO to reflect our approach (see Fig. 2 and 3). In the Object Fact Diagram (OFD) from the Fact Model [adapted from 2, p. 115], we added the new object class EXCEPTION CATEGORY to store the category of each cause, as well as the consequent binary fact type ([exception category] created in [exception kind]) and result ([exception category] has been created) (see Fig. 2). In the Actor Transaction Diagram (ATD) from the Construction Model [adapted from 2, p. 120], connected to the new result kind specified in the OFD, we added a new transaction kind called “categorization” and a new actor role, the “categorizer” (see Fig. 3).

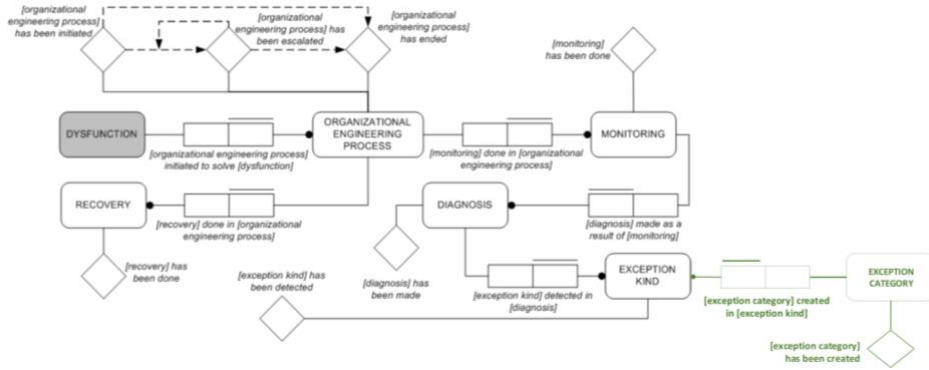


Fig. 2. Proposal of new partial OFD of the GO [adapted from 2]

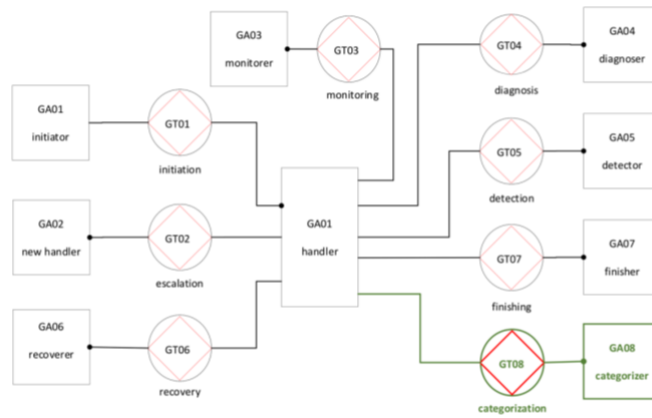


Fig. 3. Proposal of new partial ATD of the GO [adapted from 2]

Data associated with the unexpected exception is gathered in the Monitoring, Diagnosis, Exception and Recovery Table (MDERT), to which we propose some modifications. We used the example of the MDERT for the case of the library [adapted from 2, p. 117] to apply our model (see Table 1). To better understand the content of the MDERT, we added the information about each dysfunction from the Dysfunctions Table in the column “viability norm” [adapted from 2, p. 106] (see Table 1). The column “OE process” has a sequential number to identify each OEP and the column “dysfunction” mentions the number of the associated dysfunction (see Table 1). The columns “monitoring”, “diagnosis”, and “recovery” include the actions developed during the corresponding phases of the OEP (see Table 1). The column “exception kind” specifies the identified cause of the dysfunction (see Table 1).

Table 1. Proposal of a new Monitoring, Diagnosis, Exception and Recovery Table (MDERT) of a library [adapted from 2]

OE process	dysfunction	(Viability norm)	recovery	monitoring	diagnosis	exception category	exception kind
OEP01	DF01	(max loan declines per week) (Goal: 30; Achieved: 38)		verify loan register	loans have been decreasing in the last year		
				ask secretary's opinion on decrease in loan requests	the secretary informed that there are less visitors than usual, but in some months many students have their requests declined due to the max_copies_in_loan limit		
OEP02	DF02	(min average # of registrants in book history courses 1 week before start) (Goal: 14; Achieved: 9)	increase value of property max_copies_in_loan during exam season	ask students why they need so many books	every three months its exam season in nearby colleges and they need more books than normal	environment methods	abnormal high rate of loan requests due to exams season lack of planning for procedures to apply in periods of abnormal high rate of loans
			delay course start dates for 2 weeks; design, print and distribute fliers announcing courses delay	do street survey to find cause	most people (70%) did not see our ad at the newspaper nor the radio; some interested people (10%) suggested to distribute fliers and posters in bars and restaurants nearby	process environment management	inadequate advertising general lack of interest in courses lack of a suitable promotional plan
OEP03	DF03	(min average # of registrants in book history courses 1 week before start) (Goal: 14; Achieved: 11)	delay course start dates until having enough registrants	do street interview to find cause	great majority of people (90%) show total lack of interest in the course	process environment management	lack of procedure to review and update courses general lack of interest in courses courses are not adjusted to customers' needs and expectations
OEP04	DF06	(min average # of registrants in book history courses 1 week before start) (Goal: 14; Achieved: 8)	cancel courses and transfer students to prevent dysfunction in monthly income	observe DDAT and MDERT tables	it appears that the general lack of interest in courses is getting worse as delaying courses start is not enough and more drastic actions are needed	process environment management	lack of procedure to review and update courses general lack of interest in courses courses are not adjusted to customers' needs and expectations

The column “recovery” presents the recovery strategies that are usually defined based on a quick analysis of the dysfunction and without the analysis of causes. Therefore, to improve the readability of the MDERT, we argue that the column “recovery” should be moved to the left, to be just before the column “monitoring” (see Table 1).

To include the CEM in the GO and register the causes clusters, we propose to add a column “exception category” (see Table 1). In this column, it should be registered the category of each exception kind (see Table 1). We argue that each dysfunction can have more than one cause and, therefore, we modified the MDERT to include more than one exception kind for each OEP (see Table 1).

3 Conclusions and further work

In this paper, we proposed to add the Ishikawa’s cause-and-effect methodology to the organizational processes in the G.O.D. Organization. Including a more systematic and broader analysis of causes will benefit the process of causes’ analysis and, consequently, contribute to the definition of more accurate actions to eliminate or circumvent the unexpected exceptions. This approach may reduce organizational inefficiency and strengthen its viability, as it should reduce the reoccurrence of past dysfunctions and, by dealing with a wider array of causes, should also prevent new dysfunctions from occurring. The cause-and-effect analysis may be also applied to the organizational engineering processes that aim to detect opportunities for improvement (proactive change). This work contributes to the primary purpose of the G.O.D. Organization, namely, to preserve an updated organizational self and an updated ontological model.

As the main limitation, authors identify the lack of empirical proof of the proposed approach. Consequently, a test pilot with this new model should be conducted, and its

results evaluated in terms of choice of causes, selection of solutions, and general performance of the G.O.D. Organization.

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