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Limitations in detailing of EPC models

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Abstract
EPC models provide a subject widely discussed in the literature. The principles applicable, while creating them have been elaborated upon in numerous publications. An analysis of the existing principles indicates certain inconsistencies as far as the creation of hierarchical models is concerned. The problem of combining equivalent EPC models using process interfaces has been discussed in the author's previous publication. This paper continues to elaborate upon the problems previously raised, pertaining to EPC model linking by means of hierarchical functions. It addresses principles significant from the perspective of creating and linking such models using the aforementioned approach. Specific questionable situations have been described and individual solutions proposed to enable avoiding them.

Introduction

Creating models reflecting various aspects of how an enterprise functions is extremely important for efficient implementation of managerial processes in the broad understanding of the notion. Numerous models enable improved analysis and understanding, both in statistical and dynamic terms, of structures, connections, dependencies and processes occurring in an organisation, often being very complex. When commonly used, they may apply to many very diversified areas of an enterprise, for instance including strategy elements [1, 2], processes deployed and elements of their assessment [3, 4, 5], knowledge management elements [6, 7, 8], decision making support elements [9], physical phenomena affecting the working environment [10, 11] or many more. What matters particularly in terms of process modelling is a selection of the most popular graphical modelling methods. Those being used most frequently certainly include the BPMN and EPC methodologies. The concept of EPC models was presented for the first time in 1992 by G. Keller, M. Nüttgens and W. Scheer [12]. More accurate and formalised principles of creating flat models were developed by Wil van der Aalst [13] in 1999. Principles of creating and linking separate and different EPC models were proposed in 2002 in an article by M. Nüttgens and F.J. Rump [14]. However, in terms of linking of different models, they did not lack certain inconsistencies. More precise rules for EPC model linking, with specific unnecessary limitations excluded, were proposed in 2007 by V. Gruhn and R. Laue [15].

Principles of the EPC syntax are currently discussed in various publications [16, 17, 18]. This topic has also been raised in Polish publications [19, 20, 21, 22, 23]. Although the subject of EPC model building has already been widely discussed in literature, there may still be certain doubts arising with regard to the problem of their linking. The overall body of problems pertaining to linking of equivalent models by means of process interfaces, including an alternative concept proposed to be applied, has been elaborated in article [24]. The present article builds upon the considerations previously developed. In its subsequent sections, the author has discussed the problem of linking EPC models based on the principles of their detailing by means of hierarchical functions.

Principles of creating and detailing of EPC models

Assuming that EPC diagrams are graphical representations of EPC models, based on papers [13, 14, 15], one may identify principles being relevant from the perspective of their creation and expansion. And since the problems of linking diagrams using process interfaces have been disregarded in this article, and in relation to the prohibition of including process interfaces in detailing EPC diagrams postulated in paper [15], the said elements have not been taken into consideration in the selection of principles collated herein, according to which:

1. An EPC diagram consists of such elements as: functions, events and logical connectors.
2. All elements of an EPC diagram are interlinked by means of arrows depicting the process flow.
3. Each function has exactly one incoming and one outgoing arrow.
4. Each event has:
   - exactly one incoming and one outgoing arrow, or
   - exactly one incoming arrow, when it is the "end event", or
   - exactly one outgoing arrow, when it is the "start event".
5. A function may be linked with events only.
6. Events may only be linked with a function.
7. A link between functions and events may be direct or indirect, the latter using logical connectors.
8. A logical connector may be:
   - splitting – having exactly one incoming arrow and several outgoing arrows;
   - joining – having several incoming arrows and exactly one outgoing arrow.
9. "Preceding events" for a function are events occurring before the function, disregarding all the logical connectors present in the link.
10. "Following events" for a function are events occurring after the function, disregarding all the operators present in the link. A sample "following events" and "preceding events" have been depicted in figure 1.
11. If diagram EPC1 contains function F1, one which is being detailed by means of diagram EPC2, then the preceding events for function F1 must comply with the start events of diagram EPC2.
12. Start events of diagram EPC2 must be interlinked assuming the logic of a link between preceding events for function F1. As far as the transfer of logic is concerned, one may apply the principles of logic transfer described in article [15].
13. If diagram EPC1 contains function F1, one which is being detailed by means of diagram EPC2, then the following events for function F1 must comply with the end events of diagram EPC2.
14. Following events for function F1 must be interlinked assuming the logic of a link between end events for function F1. As far as the transfer of logic is concerned, one may apply the principles of logic transfer described in article [15].

Questionable situations

The main goal behind creating detailing EPC diagrams for the chosen functions of a general EPC diagram is the transparent representation of a more expanded flat diagram. One may assume that having a general EPC diagram containing function F1 and a detailed EPC diagram for the same function, it is possible to create an expanded diagram:

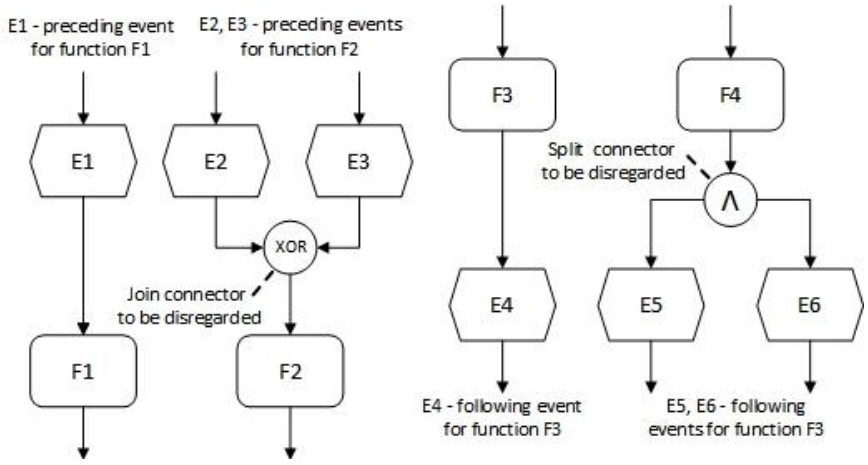

Fig. 1. Sample "preceding events" and "following events" for functions

- by combining events preceding function F1 with start events of the detailed diagram;
- by combining events following function F1 with end events of the detailed diagram;
- by inserting a detailed diagram between them.

For a method thus conceived to develop an expanded diagram, despite the principles applicable to detailing of functions by means of other EPC models, when specific interrelations occur between events, functions and operators, certain potential situations may raise doubts. In order to distinguish such situations, as a complement to the principles discussed, based on paper [24] further definitions of "proper events" and "shared events" will be introduced with reference to functions.

15. A "proper preceding event" for a function will be understood as a "preceding event" for this function which is not a preceding event for any other function at the same time.
16. A "proper following event" for a function will be understood as a "following event" for this function which is not a following event for any other function at the same time.
17. A "shared preceding event" for a function will be understood as a "preceding event" for this function which is a preceding event for at least one other function at the same time.

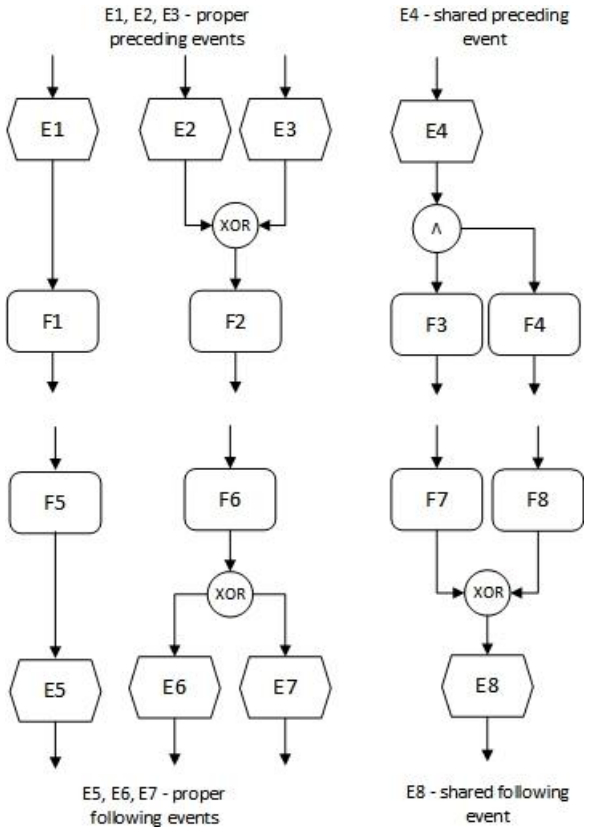

Fig. 2. Proper and shared event for a function

18. A "shared following event" for a function will be understood as a "following event" for this function which is following event for at least one other function at the same time.

A sample proper and shared event for a function have been depicted in figure 2.

Various cases of links between events and functions have been depicted in figure 3.

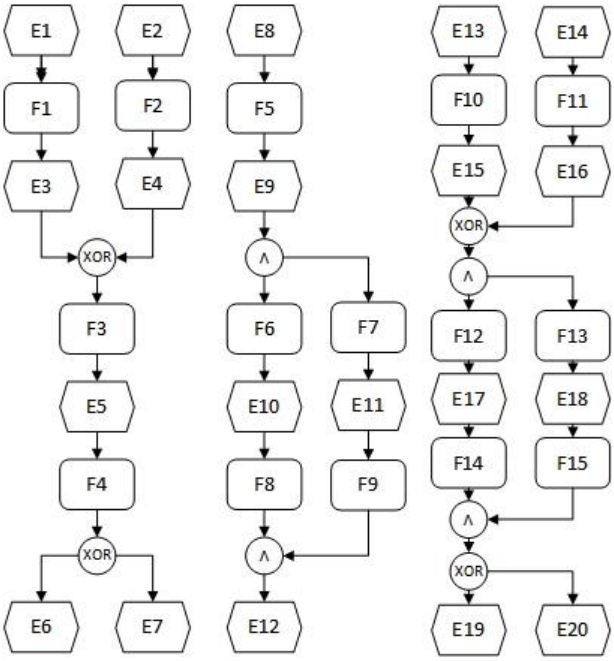

Fig. 3. Different variants of links between functions and events

The appearance of individual detailing EPC diagrams does not raise any doubts as regards functions depicted in the figure, marked as F1, F2, F3, F4, F5, F10 and F11. Sample detailing diagrams for functions F1, F3 and F4 have been shown in figure 4.

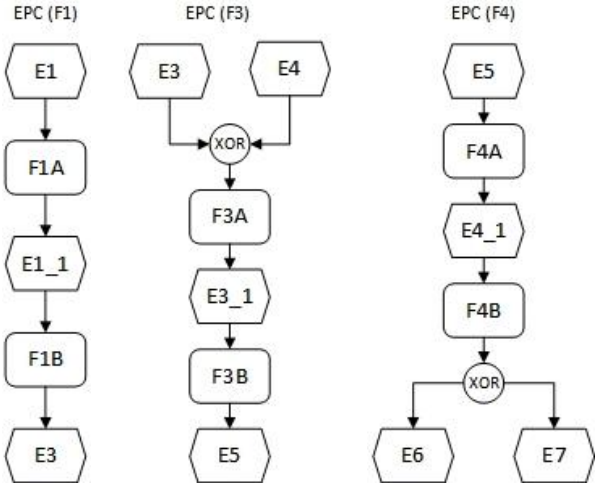

Fig. 4. Examples of simple detailing diagrams for functions "F1", "F3" and "F4"

However, the situation is not equally explicit for functions F6, F7, F8, F9, F12, F13, F14 and F15. Even if one should use the logic transfer algorithm [15] to define start events in detailing diagrams for functions F6, F7, F8 and F9, the events presented in the general diagram will be linked with a different element than those in the detailing diagram. The aforementioned algorithm proves completely inapplicable when determining end events for detailing diagrams for functions F8, F9, F14, F15. Doubts will emerge for every function having any shared events. Consequently, one may propose the following principles:

19. Explicit determination of links between start events of a detailing diagram for a function is only possible when all "preceding events" for this function are "proper preceding events".
20. Explicit determination of links between end events of a detailing diagram for a function is only possible when all "following events" for this function are "proper following events".

One may propose a concept assuming that when a function to be detailed features shared events, it is necessary to modify the general diagram in a manner ensuring that all events linked with the function become proper events. This effect may be achieved by using solutions proposed for linking of equivalent EPC diagrams [24], such as the following ones:

- inserting an additional apparent function and an apparent event linked with the latter;
- splitting an event into several partial events.

A sample modification of questionable links from figure 3 has been shown in figure 5.

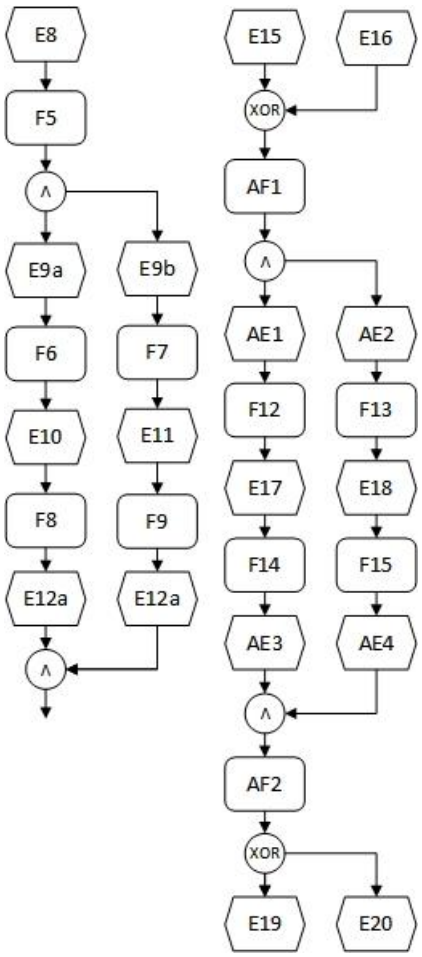

Fig. 5. Modified sections of the EPC diagram from figure 3

The modifications introduced comprise the following:

- splitting event E9 into two partial events E9a and E9b;
- splitting event E12 into two partial events E12a and E12b;
- introducing apparent function AF1 and apparent events AE1 and AE2 between events E15, E16 and functions F12, F13;
- introducing apparent function AF2 and apparent events AE3 and AE4 between functions F14, F15 and events E19, E20.

Once the modifications have been made, all functions only feature proper events, therefore, establishing a set of start and end events in detailing diagrams is not an issue.

Conclusions

Not all functions of a general EPC diagram may be represented by means of another detailing EPC diagram. If all doubts are to be avoided, such an option only emerges when all events linked with the function are proper preceding events or proper following events. The concept proposed, entailing creation of detailing EPC diagrams, envisages prior modification of the general diagram made in a manner ensuring that all functions assumed to be detailed feature proper events exclusively. The modification postulated may be conducted by introducing partial events or adding apparent events and functions.

One may also find it interesting to note that such an approach to creating EPC models enables avoiding shared events linked with functions which may need to be detailed.

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