Causal Interactions Between Agile Activities in Application Development

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Abstract

Agile management methods and tools are widely used to improve Enterprise Application Software (EAS) development. Our experience using Agile management tools like "Atlassian" "Jira" shows the lack of functionality in coordinating software development and business management activities.

The causal modelling paradigm is used to rethink the content and interactions in the hierarchy of key Agile activities: Theme, Initiative, Epic, and User story. The focus is on the content of vertical and horizontal interactions between them (Theme – Initiative – Epic – User story) for coordinating business management activities and application software development. Themes and Initiatives are in the field of business management competency, and lower-level Agile activities (Epics, User stories) in the field of software engineering project management.

The causal model of Agile activities is defined as the management transaction MT = (A, V, P, F) where management function (F) and enterprise process (P) are linked by a feedback loop (state attributes A, controls V). The management transaction (MT) identifiers location in Space of Processes SP = (AG, GE, T) is used to develop a taxonomy of coordination meta-types and coordination types.

By defining the Agile activities using the MT construct and coordination taxonomy, _the obtained causal knowledge is expressed as new attributes in the Agile project management tool "Jira"_. This enhancement to the Agile project management tool ensures checking project integrity and alignment against the company's strategic objectives. This helps to reduce the mismatch between strategic business objectives and development activities in software solutions.

Introduction

Category	2019
Successful	19%
Meet business intent	49%
Likely on time	30%
Likely on budget	36%

KPMG, AIPM, IPMA, 2019

Fig. 1. IT project success rates

Agile software development management practices are used to improve the quality of EAS project delivery for more than 2 decades. Over the years, the Agile frameworks such as Scrum, Extreme Programming (XP), ScrumBan, Scaled Agile Framework (SAF'e), Spotify model, or hybrid versions of these gained popularity mainly because of adaptability to change and reduction of project cost. One of the most widely used practices in Agile for capturing business needs is "user story". But user stories are not able to fully express the link from gathered requirements for an information system development to the strategic objectives of the enterprise.

Therefore, additionally, Epic, Initiative, and Theme concepts are used and with user stories they form the "TIES" structure. It helps to semantically link the business requirements for an information system from a user story to a strategic objective as presented in Fig. 2.
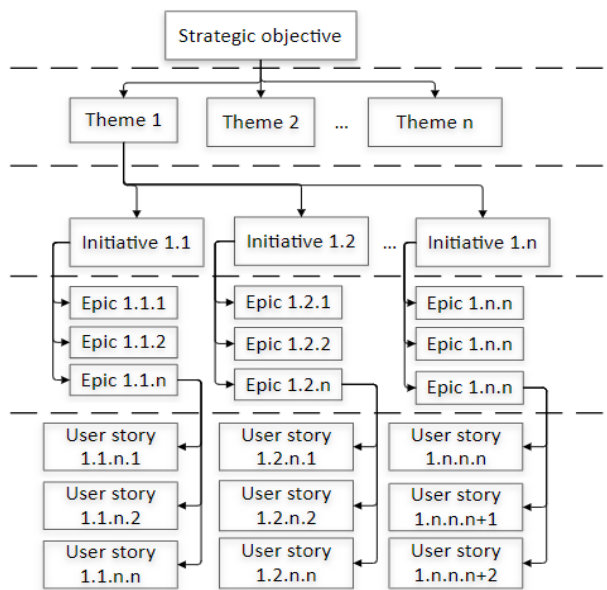

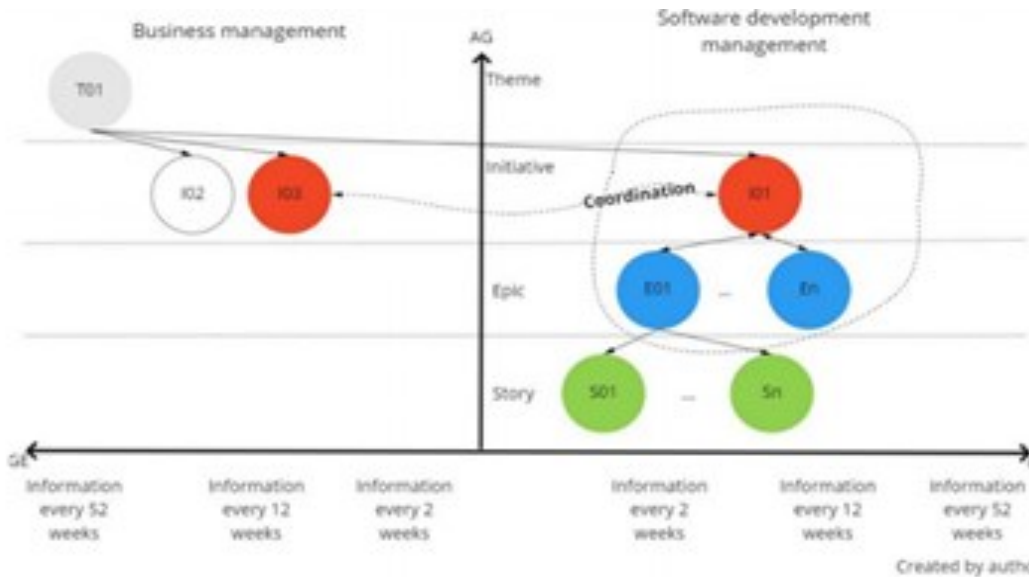**Fig. 2.** Agile management hierarchy (traditional)

Fig. 3. Case of coordination in the Agile management hierarchy

Approach to Business and IT interaction modelling

In causal modelling approach **vertical interaction** of any two adjacent levels in Agile hierarchy (Fig. 4) is considered as Management Transaction (MT), formally defined in Fig. 6. An example in Fig. 5 represents identified MT(I,E) between the levels of Initiative and Epics.
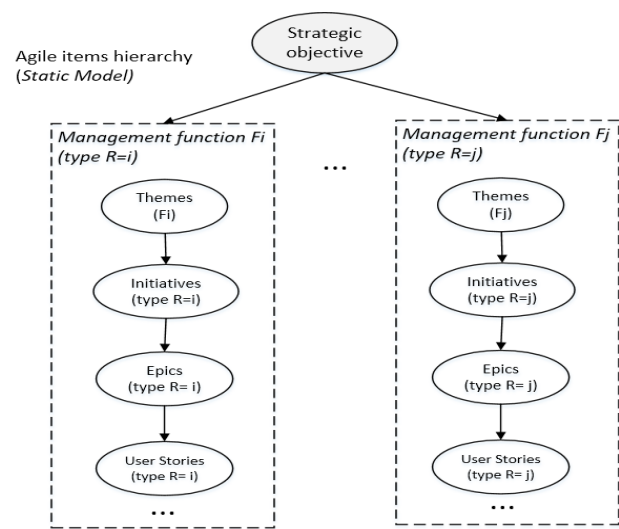

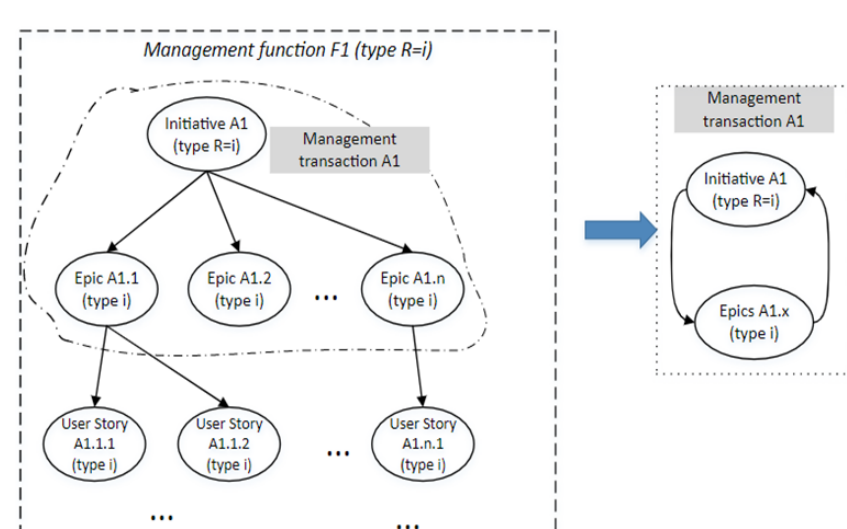**Fig. 4.** Modified Agile hierarchy with types of management functions

Fig. 5. Identification of MT(I, E) between Initiative A1 and set of Epics A1.x
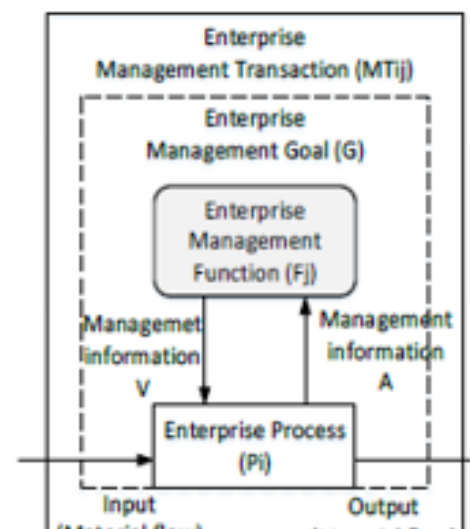
Fig. 6. Causal model of Management Transaction MT(A, V, P, F)

Horizontal and vertical interactions in Agile activities hierarchy

1. Horizontal Coordination

Horizontal coordination occurs on the same level of hierarchy: type of management function is the same (in Fig. 7) or different, i.e. type i= "business management ", type j = "software development management" (Fig. 8)
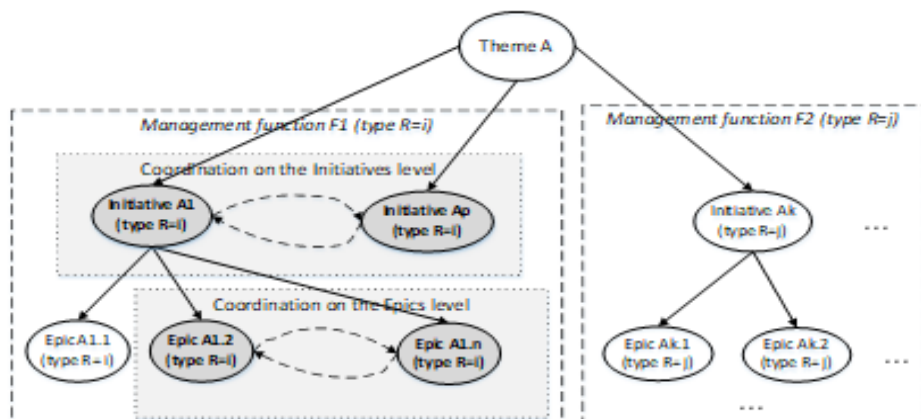

Fig. 7. Coordination of Agile activities of the same management function type R = i
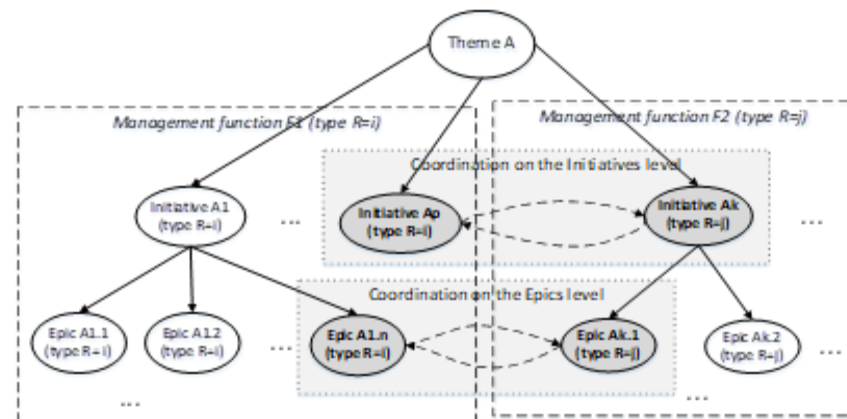
Fig. 8. Coordination of Agile activities of different management function types

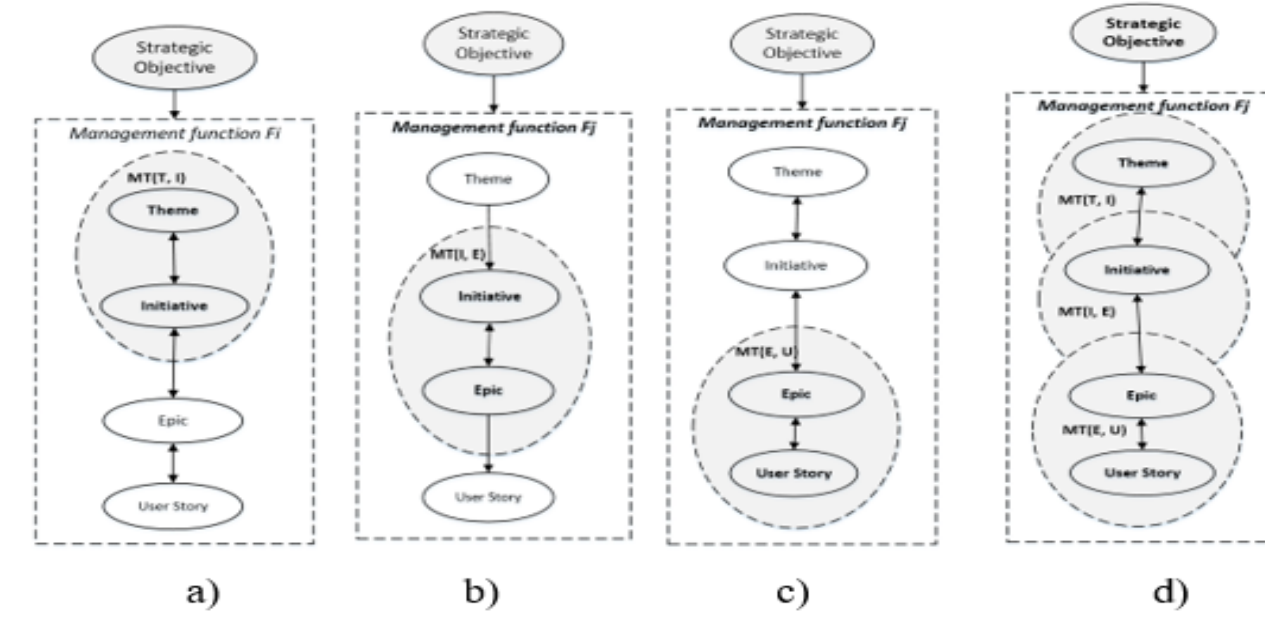### 2. Vertical Coordination

Fig. 9 Causal interaction between Agile activities levels as a management transaction (MT):
a) MT (T, I) between Theme and Initiative,
b) MT (I, E) between Initiative and Epic,
c) MT (E, U) between Epic and User story,
d) causal model of the Agile activities hierarchy
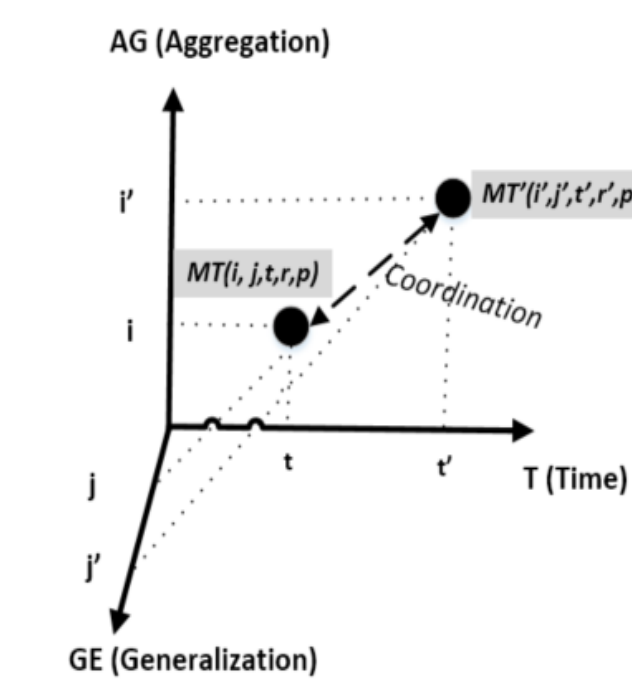
Taxonomy of coordination in the Space of Processes

Fig. 10 Coordination of MT's in the Space of Processes (AG, GE, T) (abstract case)

Type of coordinating interaction between two MT's (i.e. **content of information** transferred from one MT(i, j, t, r) to another MT'(i', j', t', r')) depends on the differences in the position of these MT's in the **Space of Processes SP = (AG, GE, T) (see Fig. 10).**

The mutual situation of any two MT's in the SP may be as follows:

- The level in the Aggregation axis (index i) is the same (i = i');
- The level in the Aggregation axis (index i) is different (i ≠ i');
- The level in the Generalization axis (index j) is the same (j = j');
- The level in the Generalization axis (index j) is different (j ≠ j');
- The type of the management function F is the same (r = r');
- The types of the management functions are different (r ≠ r');
- Process P is the same (p = p');
- Processes P and P' are different (p ≠ p')

Different combinations of index r, p, and t values are used to define MT coordination meta-types, as classified in Table 1 (here: 1 – "the same", 0 – "different"). For example, **meta-type A** denotes interaction of two activities in a single _time period t_ when a same _process p_ is managed, and _management function type r_ is the same, **meta-type C - when** _management function types are different_.

Table 1 Coordination meta-types

	Coordination meta-types							
Identifiers (t, r, p)	A	B	C	D	F	G	H	L
Management function F: type r	1	1	0	0	1	1	0	0
Process (P) identifier (p)	1	0	1	0	1	0	1	0
Time period (t)	1	1	1	1	0	0	0	0

Table 2 Coordination types

Coordination type	MT identifiers				
	i	j	t	r	p
A1	0	1	1	1	1
A2	1	0	1	1	1
A3	1	1	1	1	1
B1	0	1	1	1	0
B2	1	0	1	1	0
B3	1	1	1	1	0
C1	0	1	1	0	1
C2	1	0	1	0	1
C3	1	1	1	0	1
D1	0	1	1	0	0
D2	1	0	1	0	0
D3	1	1	1	0	0
F1	0	1	0	1	1
F2	1	0	0	1	1
F3	1	1	0	1	1
G1	0	1	0	1	0
G2	1	0	0	1	0
G3	1	1	0	1	0
H1	0	1	0	0	1
H2	1	0	0	0	1
H3	1	1	0	0	1
L1	0	1	0	0	0
L2	1	0	0	0	0
L3	1	1	0	0	0

Based on meta-types in Table 1, MT coordination types are classified in Table 2.

Definition: _coordination type A1_ describes interaction between activities from different Agile hierarchy levels (i ≠ i') in _a single time period t_ when _a same process p_ is managed by the _same management function type r_.

Example of the coordination type A1 in standard Agile project execution using TIES structure:

Coordination type A1:
ThemeTh1(i+1, j, t, p, r) – InitiativeI1(i, j, t, p, r)
Theme **Th1(i+1, j, t, p, r)** represents a long term objective: "in 2 years to reduce operational cost by X amount"; one of the linked Initiatives **I1(i, j, t, p, r)** "Stop using system Y, and transfer the features of the system to new system Z".;

Coordination type A1:
InitiativeI1(i, j, t, p, r) – EpicE1(i-1, j, t, p, r)
One of the linked Epics **E1(i-1, j, t, p, r)** "in 3 months - transfer system Y function N to system Z";

Coordination type A1:
EpicE1(i-1, j, t, p, r) – UserStoryU1(i-2, j, t, p, r)
One of the User Stories **U1(i-2, j, t, p, r)** "in 2 weeks to transfer system Y function N component K to system Z".
Coordination is occurring in the scope of one project.

Enhancing the functionality of Agile tools

Index 1 in Fig. 11 (a) represents the current attribute used in Jira to link together the activities in TIES hierarchy. But this is set by human and is often inaccurate. Index 2 represents the added attribute "Capability" that links all the related activities in TIES hierarchy based on causal modelling. The detailed information (Fig. 11 (b)) appears after clicking on Index 2.
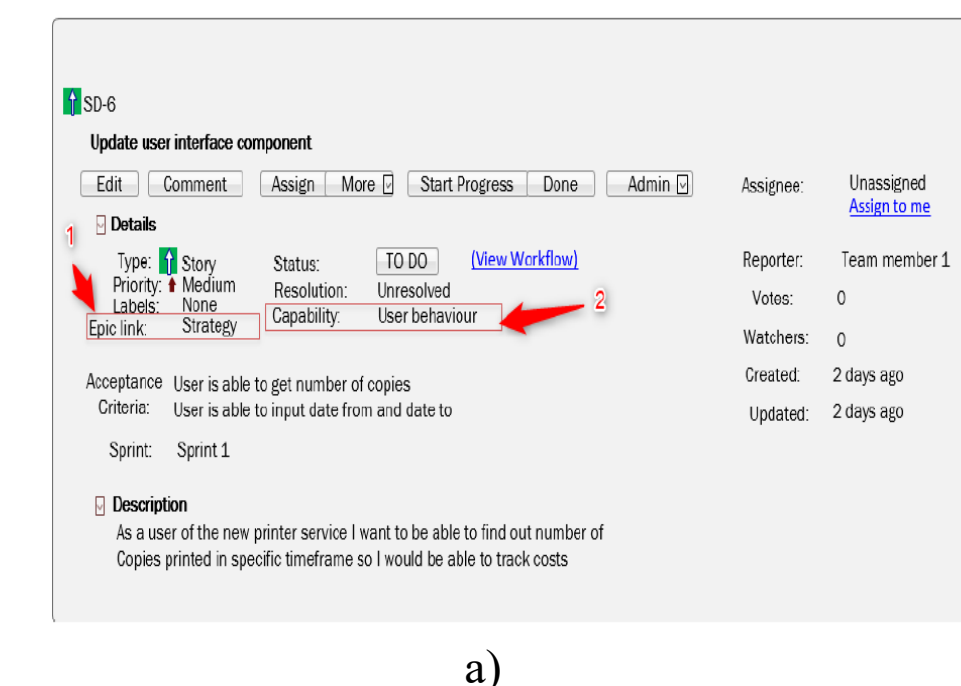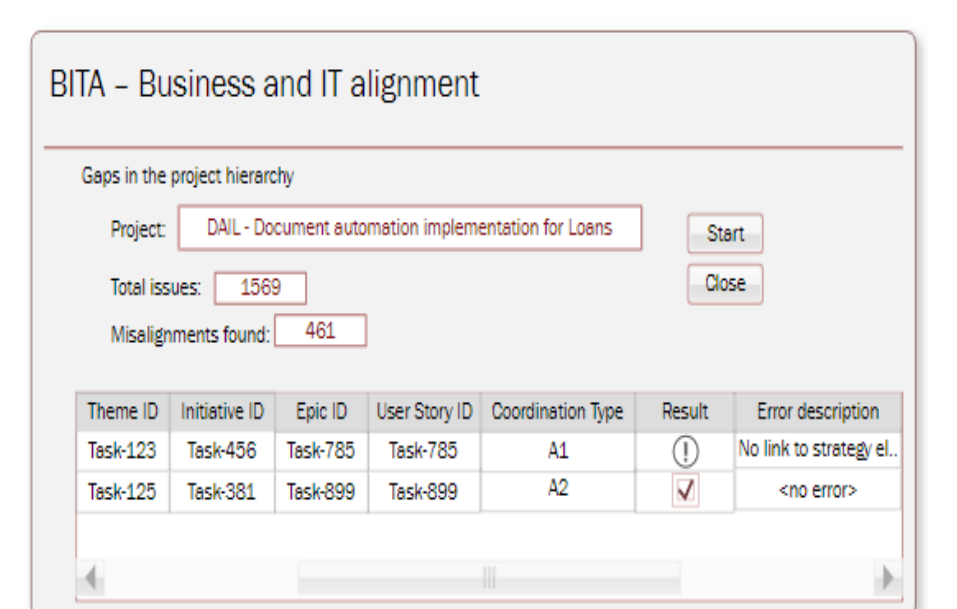
Fig. 11. Additional Jira attributes to support business and IT alignment checking