INTEGRATING RFID TECHNOLOGY IN DYNAMIC CONSTRUCTION PROCESS PLANNING

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ABSTRACT

Improving the efficiency of construction process planning needs 1) a flexible process modelling approach and 2) real-time information about running processes. Both continual real-time data and a flexible process modelling method will significantly enhance information transparency and project management activities. Thus, managers can adjust planned processes to prevailing conditions in time to avoid execution delays.

This paper presents a holistic solution to integrate Radio Frequency Identification (RFID) streaming data collected from a job-site into a knowledge base for real-time monitoring of the entire process's progress, handling exceptions in execution and supporting efficient process alternative modelling. Thereby, the focus lies on a dynamic process planning approach based on real-time information acquired via RFID. The proposed approach includes 1) configurable process models such as existing configuration process templates for exceptional handling in construction processes and 2) a method using RFID data to support the configuration of these models.

Keywords: RFID, process modelling, process configuration, knowledge management

1. INTRODUCTION

The changes within construction projects are a practical reality due to the complex nature of these kind of projects and the influence of external factors such as weather, transportation, social and political issues, etc. This demands a flexible and dynamic process planning necessary to react early to unexpected cases like temporal conflicts and resource shortages at each of the construction phases. However, the planners still rely on manual processes for asset tracking and information handling during project execution. The result is that the information of actual construction processes is incomplete, error-prone and not available on time. Indeed, the information error has 27% of disturbance causes in construction project (Gehbauer et al. 2007). Therefore, the efficient process planning is confronted with insufficient information about the current processes and necessary changes in the process flow realized in project execution. Hence, developing new processes as consequence of these changes, making a convenient decision for an alternative solution and realizing this solution without further project delay require 1) real-time information about ongoing processes and 2) a flexible process modelling approach.

At this, the paper presents (1) a holistic solution to integrate Radio frequency Identification (RFID) streaming data collected from a job-site into a knowledge base in order to monitor the entire process progress, identify and assess potential exceptions in execution in a (semi-)automated manner. (2) For handling the detected exceptions in construction processes the existing configuration process templates are used. This configuration is supported by the gathered RFID information. The proposed approach makes the construction process flexible and capable to deal with frequently changes in execution conditions. Moreover, it keeps the entire process model up-to-date.

This work discusses primarily the transportation and assembly processes of prefabricated components made of Fiber Reinforced Polymer (FRP), which are used in a modern bridge construction. Since these components have a high initial material cost, the overall project cost can be sensitive to errors and delays. Therefore, this work is driven by the “need” for accurate records of components and their status on construction site. The presented research is part of the ongoing FP7 European Project Trans-IND (New Industrialised Construction Process for transport infrastructures based on polymer composite components).

2. BACKGROUND

2.1 RFID technology for progress monitoring

The process of collecting data can be automated by emerging Auto-ID and Automatic Data Capturing (ADC) technologies like RFID, GPS, Barcode, Laser scanning, Photogrammetry, Video, Audio, etc. However, these modern technologies are still under development and the feasible applications in construction industry are available only in few prototypes. Since RFID has relative advantages over other technologies, it is used to generate and aggregate information about real world objects (i.e. Products, equipment, shipments and personal). This technology can facilitate progress measurement through the set of captured data and comprehensive monitoring of project’s status.

In construction industry the early research was focused on RFID applications for concrete handling, cost coding and material control. Goodrum et al. (2006) implemented the technology for tool tracking on construction site. Jang and Skibiwisiki (2009) introduced a new tracking architecture based on an embedded system for tracking construction asset by combining radio frequency and ultrasound signal. Klaubert et al. (2010) developed an approach based on Product data management (PDM) systems and near field communication (NFC) technology to provide the construction project progress data to all involved actors. El-Omari and Mosehi (2009) proposed a control model based on different automated data collection form job-site for progress measurement purpose. Azimi et al. (2011) suggested a framework for automated monitoring system and a progress management system respectively for steel structure construction. Kadolsky et al. (2011) suggested a solution based on a knowledge management system comprising three components: RFID data component, knowledge base and optimization component. Thereby, the core of the knowledge base is formed by ontology which describes in a formal matter the contents and relations relevant for modeling on-site processes.

2.2 Dynamic processes and changes

Construction projects are often subject to changes during execution. These changes are ascribed to the high uncertainty in the planning phase due to conflicts in the dynamic environment or the lack of information about a certain type of a construction process. In literature, the change management and dynamic planning are addressed in several research works. Motawa et al. (2007) presented some preliminary results on proactive change management through an integrated change management system composed of a fuzzy logic-based change prediction model and a system dynamics model based on the Dynamic Planning and control Methodology. Furthermore, Issac and Navon (2008) have proposed a change control tool (CCT) which creates requirement traceability through links between client requirements and the building design. Recently, Sharmak and Scherer (2011) suggested a standardized process description that offers enough flexibility to be used in a different context. And the configurable fragments in the course of the process models express the uncertain parts of the process. Sharmak (2011) in his work evaluated the uncertainty as potential causes for risks in the project and he identified these risks as potential causes for changes in the project management plan. Furthermore, the work proposed templates as a type of configurable fragments within the process models. These templates are generic and supposed to provide the flexibility needed in the process model.

2.3 Scope of the work

The work presents an approach that integrates RFID technology in order to support managers and site-engineers with reliable real-time data about the actual status of the ongoing processes. Furthermore, these data are analyzed and interpreted in a knowledge base and in combination with the configurable fragments the planned processes can be adjusted to prevailing conditions.

In this paper, the developed configurable templates approach handles potential exceptions during execution of processes. This kind of templates enables a dynamic process planning and makes the construction process flexible enough to respond in time to the changes that mainly caused by resource shortages and schedule delays. Here, the changes refer only to the changes in the project schedule plan resulting from adding tasks, cancelling tasks, substituting tasks, etc. The consequences of such changes might increase or reduce the time necessary for one or more planned process which may affect the whole project execution duration or even change the critical path of the project.

3. RFID TOOL CONCEPT FOR DATA ACQUISITION

Recently, RFID technology has become one of the sophisticated methods to facilitate progress measurement in constructions. The RFID tag can be classified mainly as passive, active or semi-active. The passive tags receive power to transmit data from the reader. They have a cheap price, small data storage capacity and short read range. The active tags use a built-in battery to transmit data. Typically they are expensive, high data storage capacity and having a long read range (Erabuild 2006). Thanks to its excellent features for the identification of static or even moving products, machines and crew in harsh environment, Ultra High Frequency (UHF) RFID system can be used in this proposed system.

To allow a continuous monitoring of all relevant components and resources throughout all construction phases a methodology is required for detecting these physical objects, their positions and their states undisturbed, automated and in real-time. The illustrated approach in figure 1 considers three characteristic layers of job site: (1) Event layer representing where the construction processes take place, (2) Network layer for the mapping of events from the event layer to network configurations to make them tractable and (3) construction site layout layer; it links the network devices to their corresponding physical locations.

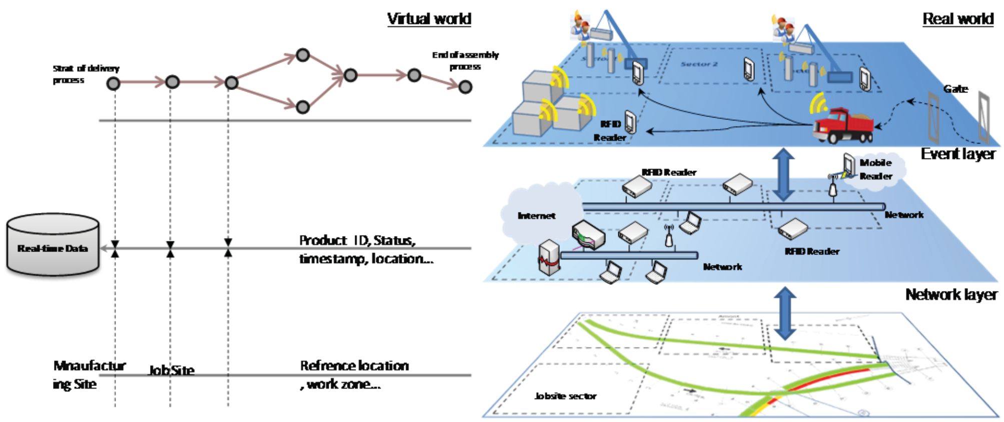

Figure 1: A concept system for embedded UHF RFID technology based on RFID reader.

By structuring of the construction site into work zones, the components status can be easily updated at job site gate, store or lay-down areas, cranes at assembly site, etc. These places are mounted with RFID reader (stationary and/or mobile). According to this system, the data can be gathered (Product ID, timestamp, product status, location…) at each process level automatically or by the foremen who can also add their comments and inspections. Therefore, the suggested system keeps the process information continuously updated. Finally, the harvest real-time data will be handled in a knowledge base.

4. RISKS AND CHANGES IN REAL-TIME DATA MONITORING

Uncertainty and risk are tightly correlated and can be defined as threats associated with indefinite source and consequences during the execution of construction projects (Migilinskas and Ustinovičius 2008). The uncertainty is a result of a lack of needed reliable information (environmental, organizational, and technical). It should be evaluated as potential causes of risk in the project. Thus risk represents an uncertain event that requests one or more changes in the project plan (Sharmak 2011).

4.1 Risk management and suggested configuration templates

Generally, there are common sub-processes describe risk management like identification, assessment, treatment planning, monitoring, treatment and risk documentation. They are connected to each other in a logical sequence. Scherer and Sharmak (2008) classified the risk management steps into four groups according to manner of appearance within the project life-cycle; repeated steps (risk identification, assessment, and treatment planning), periodic process (documentation), continuing step (monitoring) and exceptional step (risk treatment). Further, they divided the risk management steps into two loops based on treatment timing in proactive and reactive.

Sharmak (2011) suggested seven types of configuration templates offering the opportunity to specify all kinds of possible changes in a process model as a treatment of a probable or even actual risk. In a process model these templates are represented as certain instances called configurable fragments describing a way for a possible process structure change. The configuration of such fragments can represent either the actual change in the process model caused by a specific risk or the unchanged process structure. Thereby, one risk can influence the structure of the process model in more than one location and in several ways. The configuration templates are formulated as a highly generic level to provide the structure for all kinds of process changes. They are classified into three general classes:

- General Templates; these templates can be implemented in either proactive or reactive treatment cases. This group contains the Insertion, Substitution, Cancelation, and Parallelism templates.
- Interruptive Templates; used to describe a disturbance risk that affects and stops a process during its execution and contain both Stop and Action templates.
- Reactive Templates; used only as response to events which have affected tasks or products considered to be completed and consist of the Repetition and Demolition templates.

The presented templates performed a sophisticated method to ensure enough flexibility in the process model. The analysis of real-time data collected via RFID technology for ongoing activity can support the configuration of such templates by selecting the most suitable fragment for each variation point. Basically, this research work focuses on treatments for risks and problems concern project schedules that may cause execution delays. Therefore, the general and the interruption templates among others can be the most fit solution for this purpose.

4.2 Towards a holistic approach for real-time monitoring and control changes

At the planning phase risks and their related changes may be taken into account depending on the available information at the early stage of a project. However, the realism of risk assessment increased as project proceeds. Hence, new risks can be considered and omitted others. Using real-time monitoring for determining project progress the uncertainty can be significantly reduced by providing reliable information to all project actors. In this approach, the risk management concept is adopted to deal with ongoing changes in the construction process or to deal with changes that can be expected during project execution. It suggests a mechanism to add suitable configurable fragments to the process model as proactive treatment and to configure such configurable fragments as reactive treatment based on continual monitoring of process execution (Figure 2).

5. CONSTRUCTION PROCESS MONITORING IN AN RFID-BASED ENVIRONMENT

The proposed treatment cycle in figure 2 shows the expected results of real-time monitoring for process execution, exceptions identification and assessment. These outputs are mainly risks or problems. Thereby, risks and problems are distinguished by the kind of process delays and disturbance causes. The distinction between risks and problems results in a different treatment planning needed to respond to such a disturbance. So proactive treatment is necessary if the disturbance is identified as risk; if a problem is detected reactive treatment is applied.

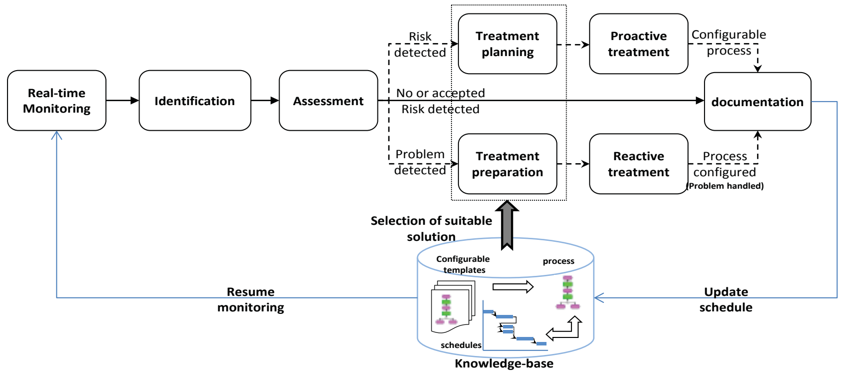

Figure 2: Proactive/reactive risk treatment cycles based on real time information.

5.1 Real-time monitoring

Real-time monitoring is a continuous process that takes place during the whole life-cycle of the construction phases. It is based on RFID technology providing continuous data about the status of the different resources to support the detection of deviations in the individual construction processes. The real-time monitoring process comprises five sub-process executed in sequential order:

- *Data capturing*: During this sub-process all captured data by RFID readers based system (illustrated in figure 1) are gathered and stored in a knowledgebase. Thereby, the data will be analyzed and RFID events resulting from redundant reading will be filtered out. Furthermore, in this step the tag-ID will be associated with a certain physical object e.g. prefabricated components, pallets of bolts, etc. The complete input for this step is formed by the RFID-events consisting of the tag-ID, the reader-ID and the current reading timestamp. At the end of this task the events will be extended by the information of the physical object, which includes the object type and a possible new ID (e.g. Beam B121).
- *Identifying object positions*: Next to the reading events the readers events including the timestamp, readers ID and the readers position will be stored and regularly updated. Such events will be triggered if a reader changes its position specified manually or automatically by GPS. The position of the readers (and their IDs) will allow to determine the position of the scanned physical objects by matching both event types. If a reader is directly associated with a resource (e.g. reader mounted on a truck), the scanned physical object can additionally related to this resource. Finally, the position of all resources will be related to a certain zone to support the identification of the related tasks. At the end of this step a composition of both event types will be generated as output. So, the output event will contain the timestamp, resulting from tag detecting or readers movement, the information of the Physical Object (object type, PO-ID), if a reading event was triggered, the information of the reader (resource type, R-ID), if the reader is directly associated to a resource, and the information of the zone the reader belongs to (cf. Li et al. 2008).
- *Identifying related construction process*: The entire construction project is described by a set of construction processes or activities depending on the level of description; each process needs to be accomplished within a defined period of time. These processes can be extracted according to work breakdown structure (WBS) of the project. Therefore, WBS and scheduling define the logical relationships between processes and assign dates and resources (i.e. components, equipment, crew…) to construction processes. Thereby, each process can be represented by a configurable or configured fragment in the entire process structure. To identify the processes affected by a triggered event the updated resources within a certain process window containing the current processes and the next direct successors will be detected. Then, the formulated relationships between processes and resources allow the identification of the corresponding processes.
- *Deriving process progress*: To derive the current progress of the identified processes the key performance indicators (KPIs) are applied. KPIs commonly denote a metric, which aims to evaluate the success and the performance of a company. In this approach KPIs are considered to determine the

progress of a construction process. These indicators are depended on the process duration, process dependencies and the resources. Thereby, the underlying metric and the available information of the required resources influence how detailed the process progress can be specified. So, the only available information about a process could be the information, that it was executed or was not executed. On the next level of detail the exact start and end time can be indicated. A further detailed specification provides information about the certain process state during its execution.

- *Determining deviation*: This step aims to achieve a continuous comparison of actual performance with planned performance for detecting process deviations. Here, the detection of deviations can be accomplished for predications (forecasting) or actual measurement values at different levels of detail (process or even activity). The comparison encompasses the resource (as is, as planned) and the date variation of current process which will discuss here in details. Table1 contains -for instance- all the possible dates of an activity in a process and their corresponding potential risk characteristic. The process in this case can define as a set of activities. This table is build based on float time (FT) for an activity and its dates. If the start and end date of forecasting or actual activity are equal or in between (early, late) start and (early, late) end of the planned date of the same activity respectively then the activity is executed without delay. Therefore, the activities executed on time or even have opportunity which is beyond our domain. The forecasting activities with (FT>0) starts or ends after the late-start or early-end of their planned dates, then these activities subject to potential delay according to the total float of the project. In contrast, if these activities are on the critical path (TF=0), then they are in risk (i.e. delay). Similarly, the actual dates (A_S, A_E) of an activity is discussed in this table. If the actual activity is on critical path and starts after late-start planned (P_{LS}) date or the end date of actual activity is exceeded the late-end planned (P_{LE}) date hence this activity has a problem that must be treated (see figure 2).

Table1: The matrix of an activity dates and its concern possible risk characteristic.

Planned activity (P)	Float time (FT)	Forecasting (F)			Actual start (A_S) /Actual end (A_E)		
P_{LS} - P_{ES}	0	P_{LS}= F_S =P_{ES}	F_S before P_{ES}	F_S after P_{LS}	P_{ES} =A_S = P_{LS}	A_S before P_{ES}	A_S after P_{LS}
P_{LS} - P_{ES}	> 0	F_E between (P_{LS},P_{ES})	F_S after P_{LS}	_	A_S between (P_{ES}, P_{LS})	A_S after P_{LS}	_
P_{LE} - P_{EE}	0	P_{LE} = F_E = P_{EE}	F_E berfor P_{EE}	F_E after P_{LE}	P_{EE} = A_E = P_{LE}	A_E before P_{EE}	A_E after P_{LE}
P_{LE} - P_{EE}	> 0	F_E between (P_{LE}, P_{EE})	F_E after P_{EE}	_	A_E between (P_{EE}, P_{LE})	A_E after P_{EE}	_

FT=0 => activity on critical path of project. ES (early-start), LS (late-start), EE (early-end) and LE (late-end)

opportunity /accepted	potential risk	risk	problem

5.2 Identification of risk

Based on the analysis of monitoring phase outputs a new risk can be added or a planned one can be eliminated. The focus here is on the risk output while a problem is typically a consequence of evolving a risk event. Thereby, the identification of the risk is a necessary step to determine which types of risks may affect the project by interpreting monitoring outputs and identifying their characteristics. The core element of this step is formed by a risk type catalogue, that is a kind of extensible lookup table including necessary information about risks or even problems and their possible treatments. Hence, the stored information (the risk description as well as the treatment methods) can be specified in different levels of detail. So on the one hand, if the risk can be clearly identified and the way of treatment is formulated in an appropriate quality the further steps shown in figure 2 can be omitted and the process model updated and documented. On the other hand, if the risk can not be identified or associated to a certain type the risk catalogue has to be extended.

5.3 Assessment

The assessment process aims to estimate the impact and probability of detected risks and to prioritize the risks according to their potential effect on the project objectives. It can be mainly comprises two types of risk analysis:

- Qualitative analysis: Qualitative Risk Assessment relies on judgment and experience. The result of this analysis is a relative ranking or prioritization of risks combined with a risk categorization.

Qualitative risk analysis typically precedes quantitative risk analysis. All or a portion of the identified risks in qualitative risk analysis can be examined in the quantitative analysis (PMBOK 2004).

- Quantitative analysis: uses percentages, probabilities and numbers to assess the effect of risks on project success (PMBOK 2004). Some organizations provide meaningful quantitative risk analysis using simulations and modelling tools to show possible consequences to cost and schedule.

The estimation of the risk impact and the risk probability is used as a criteria for identifying how the detected risk should be handled. Differing from the results of the determining deviation step this can lead to a new identification of risks and problems:

- If the impact and/or the probability of the risk is high then the risk is handled as problem requires a reactive treatment.
- If the impact and/or the probability of the risk is low then it is assumed, that the risk does not need any treatment or the risk and its impact is accepted.
- For all other risks proactive treatment provides an appropriate solution.

It should be mentioned that a risk is also identified as accepted risk if the results of proactive treatment as well as of reactive treatment will be insufficient.

6. DYNAMIC PROCESS PLANNING USING REAL-TIME INFORMATION

The discussed configurable templates represent the flexibility that needed in construction process models. The real-time monitoring approach above determines the actual process status and the state of arising risks in execution. Accordingly, it suggests a suitable configurable fragments that represent the risk treatment as response to the exceptions. Figure 3 shows the interrelationship between actual construction process and planned one based on real-time information in cooperation with the configurable templates to control the construction processes. Thereby, the real-time information lead to add configuration templates as configurable fragments to a certain process model in the sense of alternative process planning or to configure such a configurable fragment in the sense of selecting an alternative process. The first method describes the idea of proactive risk treatment; the second the idea of reactive risk treatment.

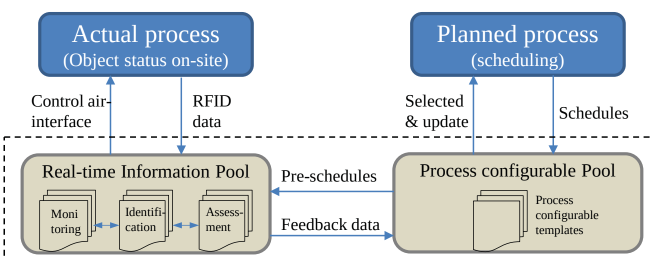

Figure 3: The interrelationship between actual and planned process.

6.1 Proactive treatment planning

This step may start at the early stage (i.e. planned phase) of a project life-cycle and repeats as an exceptional event detected during the project execution. It aims to determine alternatives to increase the opportunities and reduce threats (Sharmak 2011). Proactive treatment is a complex procedure comprising the specification of the process templates for certain situations and the optimization step, which determines the best alternative or a set of alternatives appropriate to handle the detected risk. The solutions of the treatments are represented as alternative process fragments usually added by (xor) configurable connector in the process model. Figure 4 shows two examples for proactive treatment. First, there is an interruptive template realized as configurable process fragment added, which defines the alternative process flow in the process model, if an unique component is out of the job-site. Second, a substitution template is added, which describes how to react if a crane is damaged. Cause of the complexity the proactive treatment procedure is only applied, if risks or potential problems are detected and there is sufficient time to treat such disturbances.

6.2 Reactive treatment preparation

According to the previous treatment a risk detected during monitoring, identifying, assessing and the convenient treatment solution is defined as a configurable fragment within processes model. As the risk increased in its rate to be a problem, the reactive treatment has to prepare (figure 2). Moreover, the reactive treatment determines based on the actual information about the process, resource states, etc. So, the result of reactive treatment is a configured fragment in the process model which assumed to be a suitable response to such a problem during the project execution. Here, figure 4 shows three cases of possible configured process models resulting from the configurable process model generated in the proactive treatment phase. While case 1 describes the planned undisturbed process flow, case 2 and 3 represent alternative process flows, which are determined if a component or a crane are missing.

7. KNOWLEDGE BASED INTEGRATION

The approach of an ontology (figure 5) specific knowledge base serves two purposes. Firstly, the underlying ontology provides a uniform vocabulary organized as class schema to consolidate the different information generated by the involved project partners. Thereby, this information including the different descriptions of the processes, resources, etc. formulated in various formats is mapped on the concepts of the ontology and integrated in an overall context. Secondly, the ontology as logic based description method supports a (semi-)automatized dynamic process planning by formulating derivation rules and deducing additional information required for filtering events, identifying risk types, configuring process fragments, etc. To fulfill the tasks of the suggested risk treatment cycle and to specify the different dependencies between the construction process steps and the related resources the ontology consists of three model descriptions.

7.1 Static model

The Static Model describes on the one hand the physical objects (PO, e.g. prefabricated components, construction vehicles, etc.) and the structural objects (SO, e.g. building site, construction site section, etc.) grouped into the construction domain model. Thereby, these elements and their relationships represent a planned event in the construction process, which should be reached in a defined time. On the other hand the static model includes the sensor model containing the reader and the transponder element. Each of these elements is related with an element of the construction domain model to describe, for instance, that a RFID tag is mounted on a component or a RFID reader belongs to a certain section in the real world. By embedding these logical descriptions in appropriate derivation rules the planned performance can be automatically compared with actual performance.

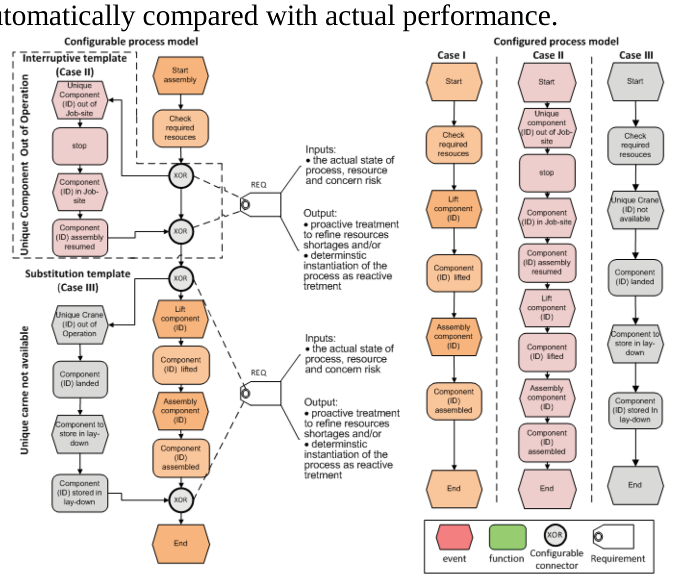

Figure 4: An examples for proactive and reactive treatment.

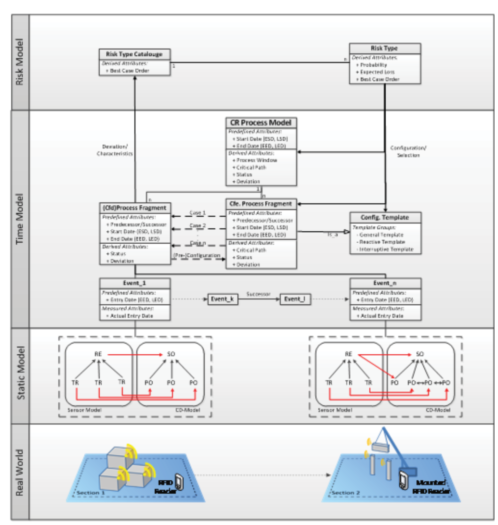

Figure 5: Ontology knowledge base approach for risk treatment cycles.

7.2 Time model

Events form the smallest unit in the time model. As a part of a process fragment they connect each instance of the static model with such a fragment to derive its current state and to detect a possible deviation. So, an event description should be clearly expressed to identify automatically, when an event was occurred. Events can have predecessor or/and successors, so that an additional method is given to determine the event state. The derivation rules formulated to derive the state of the current process fragment are called key performance indicators (KPIs). Here, the information of all aggregated events, of the predecessor/successors fragments and the time of the process fragment needed, influences the determination of the process progress. The continuous derivation of the state of each fragment results in a continuous derivation of the state of its successors and of the whole configurable reference process model (CRPM) and its attributes. If the process fragment is a configured fragment the information of its state will also enable a (pre-)configuration of its corresponding configurable process fragment and its successors.

7.3 Risk model

To identify the correct treatment for a problem or a risk, a rule based interpretation function is defined analyzing the information of the disturbed process fragment to find the corresponding risk type. Therefore, an extendable risk type catalogue is developed and implemented serving as a kind of look up table. The risk type catalogue is based on the experience was gained in other projects and the assessments was made by quantitative and qualitative methods. The result of the interpretation function is a number of risk types. Thereby, the most suitable risk type gets the highest priority. Furthermore, the description of the risk types contains methods to treat with the identified risk. If the risk is identified as problem reactive treatment takes place. Depended on the level of complexity the solution of the risk treatment is described a single configurable process fragment, a set of configurable fragments or a configurable sub-model is configured with regard to the information of the resource states. If the identified risk type requires proactive treatment as response to the detected process delay the proposed solution can also be formulated in different levels of detail influencing the complexity. So, the suggested treatment output can be specified in an abstract manner and the proposed solution will only be a set of configuration templates. In a more detailed description the proposed solution consists of a pool of configurable process fragments. Thereby, the underlying static model can be also represented in different details. So, to support a computer based dynamic process planning the planned process model and the solutions for risk treatment should be formulated in the same level of detail.

8. CONCLUSION

The paper focuses on a holistic solution to improve the process planning in construction project. It comprises a flexible modelling method based on configurable process templates used to respond to the frequently changes in construction site conditions. RFID data gathered from the construction site are used to react in time to such changes as well as supporting the application of these templates in this modelling method. Starting point for this modelling method is a proposed treatment cycle and its relevant phases, which have to be completed in order to adjust a planned process model according to detected exceptions. The first three phases in the treatment cycle specify the risk and its characteristic necessary for supporting risk treatment by process template. The treatment procedure itself distinguishes between risks and problems and a proactive and reactive solution. While the proactive treatment perform alternative processes planning and making the process model capable to deal with exceptions, the reactive treatment focuses on the selection of an appropriate solution. So, the results of proactive treatment are configurable process fragments integrated in the process model. In contrast, reactive treatment makes use of these solutions and configures the process fragments as selection of a certain alternative. Both treatment types are based on a continual monitoring of process execution. To support a (semi-)automatized dynamic process planning RFID information, the process templates and the entire process model are managed in a knowledge base. This opens up the possibility to formulate dependencies in a logic-based manner and to derive additional information required for filtering events, identifying risk types, configuring process fragments, etc.

This paper describes an approach for a dynamic process planning method. Future work will be a realization of this method by implementing the relevant elements like the KPIs or the risk catalogue. Also the configuration templates should be further elaborated and extended with information of the certain domain.

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