CONTRIBUTION TO DEVELOPMENT OF TELEMATIC SERVICES FOR DATA ANALYSIS IN TECHNOLOGY AREA. APPLICATION TO E-HEALTH FIELD.

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AtlantTIC

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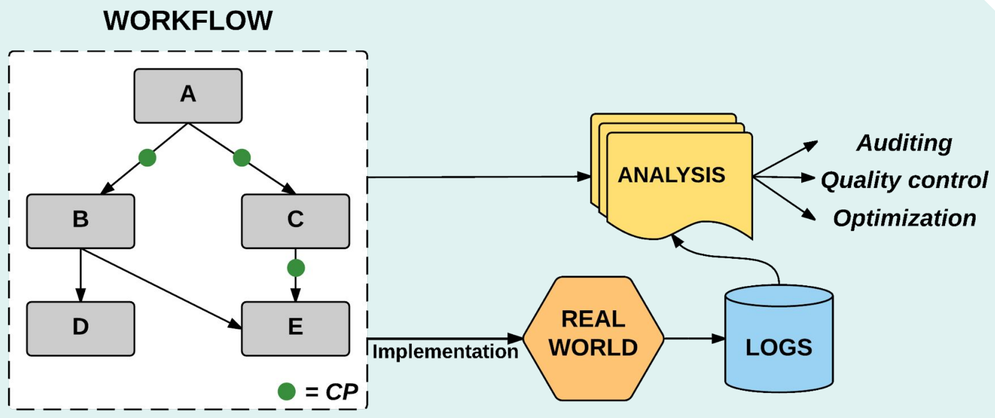
MOTIVATION

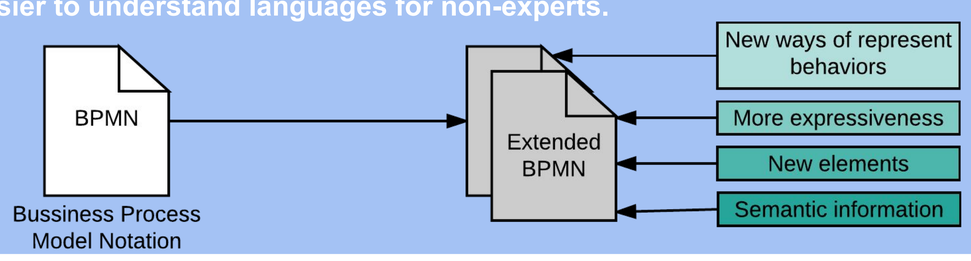
- **In some contexts, such as health, process monitoring is very important. It is necessary to control, check and verify the implementation of workflows in actual scenarios.**
- **Currently, ICT-based implementations and analysis techniques are gaining momentum providing a large set of advantages in auditing, quality control and optimization of procedures.**
- **Process Mining techniques are in continuous growing. It is a relatively young discipline and a lot of researches and futures lines are open. This PhD research tackles some shortcomings identified:**
  - **Some techniques are thought for workflows in which all the activities are monitorized. What happens with no-monitored activities?**
  - **Limited expressiveness of modeling languages. There is information that it is not represented in a machine interpretable format (therefore it can not be used in analysis).**
  - **It is necessary to improve the detection, prediction and recommendation of different behaviors.**
  - **Usability and understandability of these techniques are only reserved to experts.**
  - **Combining Process MIning with other types of analysis is desirable.**



THESIS OBJECTIVES

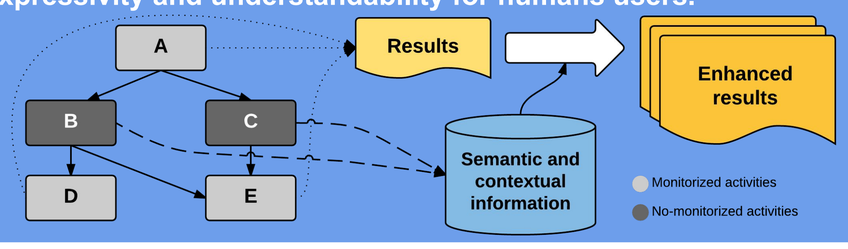
About modeling languages:

- **Extension of current modeling languages for improving its expressiveness.**
- **Expressivity about behaviors and information about the context. Using current standards, only support for some pieces of information in natural language is possible.**
- **The workflow language must take into account all kinds of information available.**
- **Easier to understand languages for non-experts.**



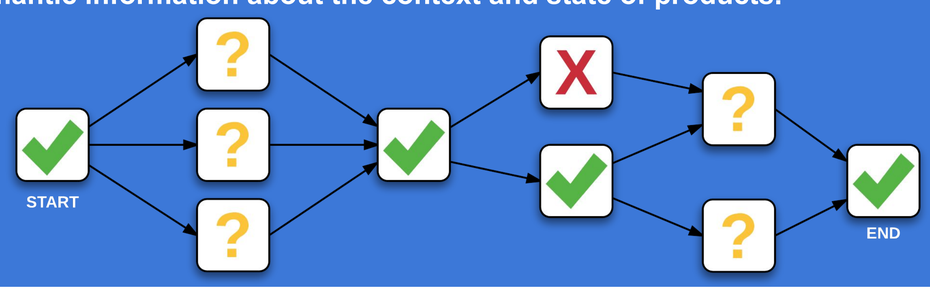
About adherence to protocols:

- **Improve current conformance checking techniques by taking into account:**
  - **No-monitored activities.**
  - **New semantic and context information provided by languages proposed.**
- **Automatic tools for evaluating protocol effectiveness (e.g. simplicity)**
- **More expressivity and understandability for humans users.**



About new types of analysis and results:

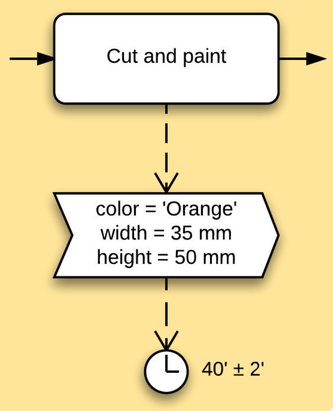
- **Detection, recommendation and prediction of different behaviors (e.g. prediction of products' end state) by combination of process mining with ML and DM techniques.**
- **Analysis of "probability of taked paths" for no-monitored activities using semantic information about the context and state of products.**



RESULTS & DISCUSSION

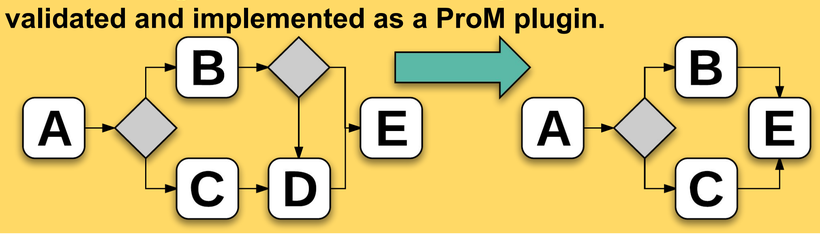
Two research papers (one presented at WORLDCIST'16 conference, one sent to Science to Computer Programming Journal [indexed in JCR]):

- **Different elements for extending BPMN language are proposed. The goal is to improve the expressiveness adding new ways of represent new types of information.**
- **Gives the possibility of express semantic knowledge about activities, behaviors and the application context in a machine understandable fashion.**
- **Software for the ProM framework in order to integrate the BPMN extension in current Process Mining techniques is proposed as plugins.**
- **Gives an outlook about feasible improvement of current techniques. Discuss some future interesting guidelines.**



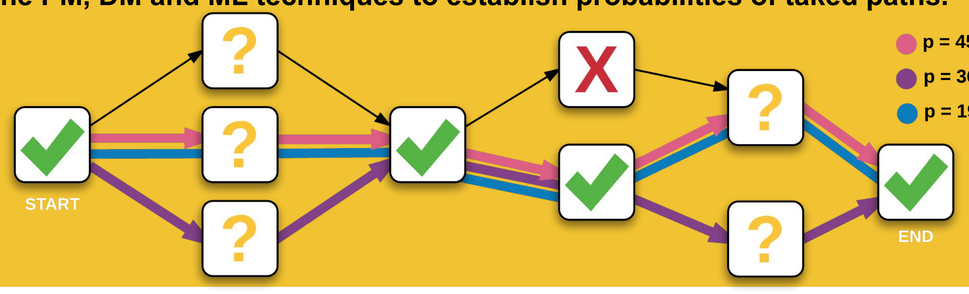
Two research papers (one presented at CISTI'15 conference, one sent to Journal of Visual Languages and Computing [indexed in JCR]):

- **The first gives a theoretical perspective on objectives exposed in this PhD. A first impression of different architectures, automatic tools and models are discussed.**
- **The second describes a pattern based method for simplifying a BPMN process model. A two-phase iterative algorithm to achieve an optimized version of a BPMN model is discussed, validated and implemented as a ProM plugin.**

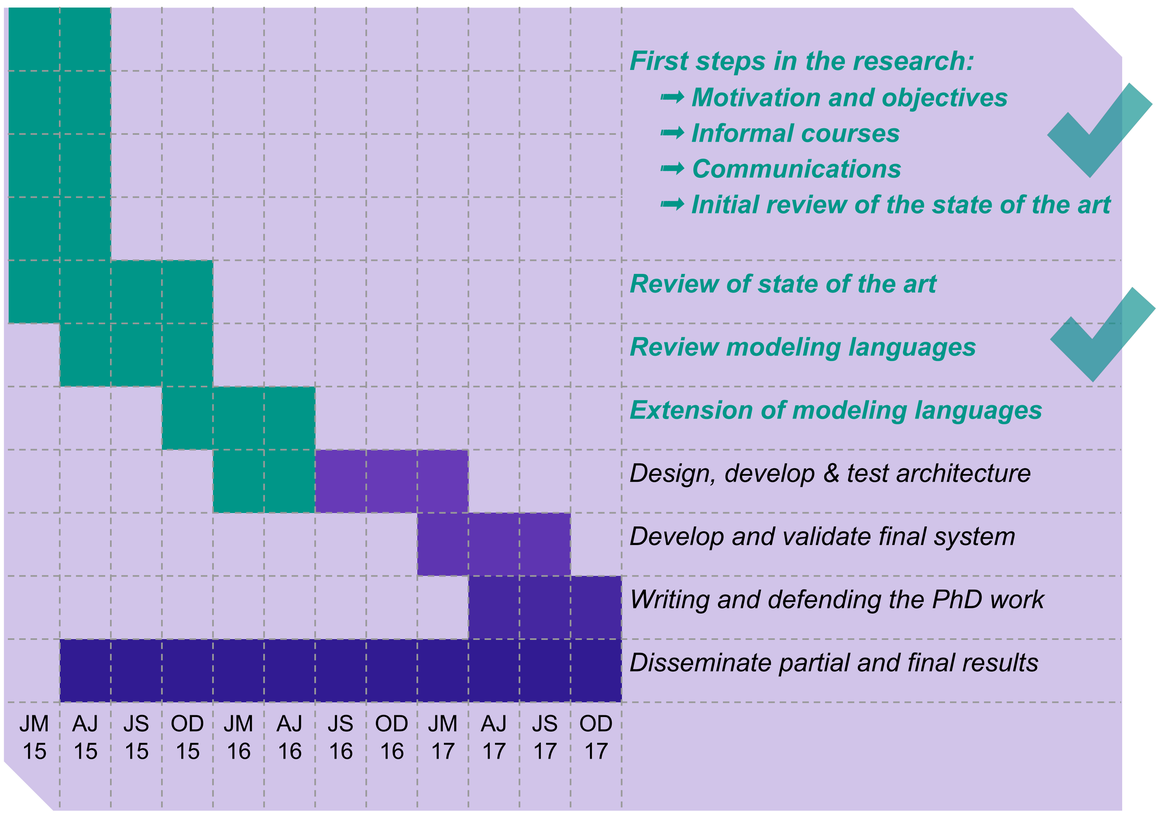


Currently working on a research work about "probability of taked paths":

- **Applicable on workflows mixing monitored and no-monitored activities.**
- **At first, it is not possible to know the path taken by a product (different possibilities)**
- **It is used semantic information about the model given by the BPMN extension proposed and previous measured experiences in the workflow of interest.**
- **Combine PM, DM and ML techniques to establish probabilities of taked paths.**



RESEARCH PLAN



NEXT YEAR PLANNING

- Developing of models, architectures and plugins using the preliminary results.
- Proof-of-concept studies in **real health scenarios** using the works and research proposed
  - Application of the researches to health scenarios.
  - Validation of different architectures, models, algorithms and techniques proposed.
  - Will be conducted in the frame of the PIS project (Instituto de salud Carlos III)
- Disseminating final results and discussions about research in international journals.
- Analysis of all works and researches performed and elaborate final conclusions.
- Writing and defending the PhD work.

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