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Toward an Agile and Soft Method to Develop Business Intelligence Solutions

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***Abstract*—this paper presents the first version of an agile and soft method to develop business intelligence solutions. It is based upon three agile methods for software development, namely, SCRUM, XP and KANBAN, and also is based on the Soft System Methodology. The model is a partial result of an ongoing research project in small and low maturity teams with no experience in the business intelligence development process.**

Keywords: Business Intelligence, Agile Development, Action Research, Soft Systems Thinking.

I. INTRODUCTION

Iterative methods for software development arose as an alternative to anti – naturalness of traditional methods, inspired on misinterpretation of Royce's paper in 1970 [1]. And agile methods broke into scene as a subset of iterative methods in response to inefficacy of heavy iterative methods to deliver software with valuable features to organization on time, and on budget [2]. Nowadays, agile methods are accepted in software engineering community as a valid approach to develop software for information management [3]. The well – known SCRUM and XP are the most used worldwide, or separately or together[4].

Success of these method lies in their separation from cybernetic paradigm, so do not take a mechanistic approach, neither software, nor the development process. But, on the contrary, require that the software developed under this paradigm change depending on organizational needs. This is achieved by incorporating practices that encourage feedback scenarios, namely, daily meetings, the re-prioritization of user stories, retrospective, test driven development, frequent demonstrations, freedom to add new requirements, incorporating customer within the team. In this way the changes are perceived by the development team as close in time, the moment they occur. This prevents that errors and obsolete requirements flow through the phases when his detection has a higher cost. As stated in[5]
Equally, Soft Systems Thinking (SST), has emerged within the discipline of information systems as an alternative to incorporating software within organizations[6]. It allow professionals within this discipline cover activities that are not present in the software development methods, namely, (a) cultural analysis of the organization, (b) policy analysis, (c) study of worldview of stakeholders in the project, (d) a mechanism to structure debate in order to reach changes systematically desirable and culturally feasible. All the above led to fostering an environment in which the organization and incorporating software, form a whole. Spite of benefits, this approach is not frequently used since it does not provide the practices and activities that the developer wants to find.

On the other hand, the market of Business Intelligence Solutions (BIS), software that through timely delivery of understandable information enable organizations to make better decision that help meet their objectives, is constantly growing at an annual rate of 11.5% [7]. However, parallel to this, failed projects rate exceeds 50% [8]

According to [9][10], the factors that have led to the failure such solutions are: changing requirements, changing design, lack of training, importance solution is not perceived, selection of erroneous technology, communication troubles, erroneous planning, lack of leader, lack TI management, absence of process reengineering, resistance to organizational change, presumption of necessity, discrepancy between stakeholders worldview.

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But these factors have been present in the transactional system development and design of information systems from their origins. And both disciplines, Software Engineering and Information System have proposed improvements to their methods for dealing with these factors. Initially, these improvements were described, agile and soft. In **TABLE 1**, it can be appreciated that factors are treated by each method.

TABLE 1. FACTORS BY APPROACH

factors	Approach
Changing Requirements Changing Design Lack of Training Importance is not percived Selection of Erroneous Technology Communication troubles Erroneous Planification Lack of Leader Lack TI management	AGILE METHOD
absence of process reengineering Resistance to organizational change. presumption of necessity Discrepancy between stakeholders worldview.	SOFT

This is the reason for which the proposed model is inspired by the well – known agile methodologies XP, SCRUM and KANBAN and in Soft System Methodology.

In the following, this article first presents a brief description of what a business intelligence solution, how it is used for and its components. Then, it presents which process models for the development of business intelligence solutions exist. After it introduce the methodology being used to design the model and the Model. Finally, it presents the conclusions, future work and bibliographic references that support this document

II. BUSINESS INTELLIGENCE

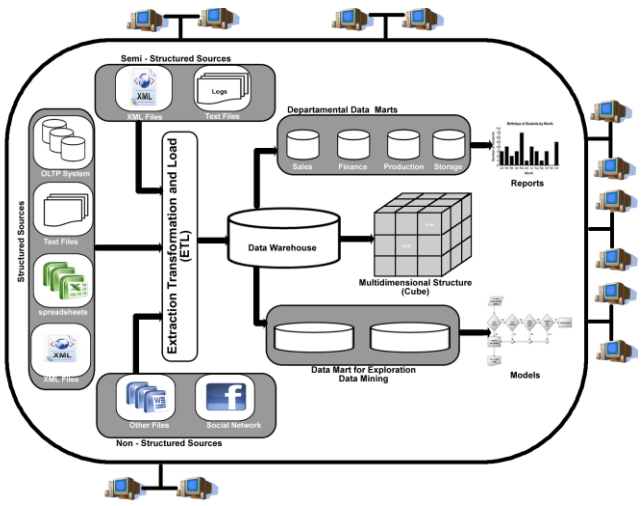
According to The Data Warehouse Institute (TDWI), a BIS: is a umbrella term [11], namely, the combination of technology, tools and processes that allow to transform data stored in information this information into knowledge and this knowledge led to a business plan or strategy. Business intelligence should be part of business strategy, this allows you to optimize the use of resources, monitoring compliance with the objectives of the company and the ability to make good decisions and get better results.

Basic components of a BIS are [12]:

- Data Sources: come from different files such as spreadsheets, flat files, databases and OLTP systems.
- Data Warehouse and/or Data Marts: modeled in a multidimensional addressing the requirements and business structure.
- OLAP and Data Mining: provide new information to companies and better performance of business intelligence systems.
- Data Access Tools: allow end users to view and analyze information.

En la **FIGURE 1**, podemos ver la arquitectura tradicional de una solución BI.

FIGURE 1. COMPONENTS OF A BIS



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Additionally, traditional methods do not work for this type of solution due to the differences existing between them. In the **TABLE 2** you can see a summary of these differences.

TABLE 3. MODELS OF BIS DEVELOPMENT

Component of BI	References	Main Ideas
Data Warehouse	[12][15][16] [17][18][19]	• Extension of E/R modeling • OO modeling. • Conceptual model for Data Warehouses • Model based in agile methods • Model base on unified process.
Data Mining	[20][21]	• UML profiles for Data Mining • Iterative Methodologies.
Business Intelligence	[22][23][24]	• Lifecycle model • Model based in agile methods • Model base on unified process.

TABLE 2. OLTP SYSTEM VS BIS

	OLTP	BI
Users	Operatives	Strategic
Access	Few records	Lot of records
Use	Obligatory	Optional
Fuzzy Requirements	Low	High
Business Logic	By process	By information
Function	Move the business	Analysis business movement

A. Others Models

In the literature, although there are a large number of work around the techniques and technologies that make up BI solution (**TABLE 3**). This is an immaturity field with no standards and a very low level of detail in the models of development, limiting the entry of small development teams with low levels of maturity.

In **TABLE 4**, you can see there is not a complete methodology, agile and with a high level of detail. In Gartner report about emerging technologies [13], data analysis technologies (which is part of the BI) are located at an consolidation phase. And that demand the development of new methodologies and practices.

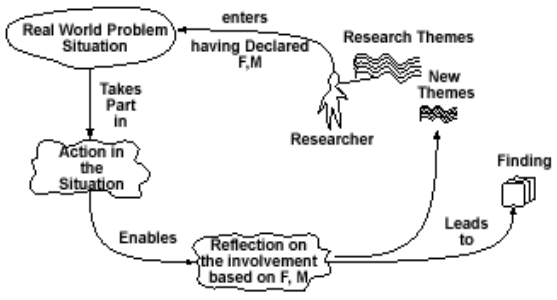
III. METHODOLOGY

Selecting methodology for this research was made considering the expressed in [14], research in the discipline of software engineering has two (2) purposes: (1) support the software development practices. (2) Dealing with the social aspect of software engineering.

In this vein, the research method selected was the defined in [6] as Action - Research. In this approach, the researcher, who has declared his interest in some issues, engages in social practices of a real-world situation (A) perceived by people as problematic (contrary to an experimental situation created in a laboratory), in which interest topics, declared previously, are relevant to cause. However, to maintain consistency during surgery is required to explicitly declare a framework of ideas (F) to support its actions in the situation, and a methodology (M) to guide the way they act in the situation.

By engaging in a particular situation, the researcher assumes a dual role, namely, as a researcher and as a participant in the situation. We must work to bring about change and "improvement" in the situation in which it is involved, and you should assume a continuous reflection on the collaborative work developed and its results, consistent with the framework of ideas and methodology. **FIGURE 2** shows an outline of the research method - action.

FIGURE 2. ACTION - RESEARCH METHODOLOGY



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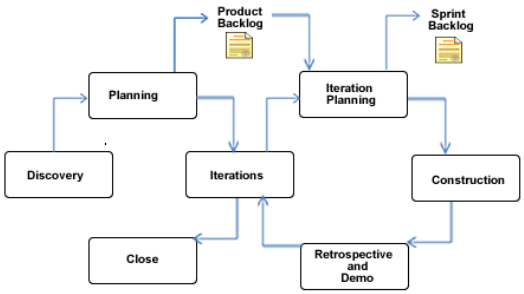
The cycle of the previous figure can be defined as a process, where it is evident the need to rethink, based on actions taken in the intervention, The intervention process, including the establishment of roles, the framework of ideas and methodology of reference, and the actions taken as part of the process of organizational transformation.. Additionally, it makes explicit the need to establish an end point for the intervention process, which is usually arbitrary, so that the researcher can account, from a process of reflection on the experience, the learning outcomes with relation to the framework of ideas (F), the intervention methodology (M) and reality intervened (A).

FIGURE 3. PHASES OF THE MODEL.



Further, in the **FIGURE 3**, can be seen the division made of phase de iteration according to the methodology SCRUM: Iteration Planning, Construction and, Demonstration and Retrospective.

In Addition, construction phase was divided making explicit the set of activities that must be done every iteration for each user story that is being worked, and thus deliver value (**FIGURE 4**).

TABLE 4. CHARACTERISTICS OF BIS MODELS.

Methodologies	Development Life Cycle	Detail Level	Team Maturity Level
RALPH KIMBALL Lifecycle	Cascade	High	High
DSDM DW	Iterative	Low	High
HEFESTO	Cascade	Low	High
DWEP	Iterative	High	High
MBD	Iterative	Low	medium
SCRUM	Agile	Low	High
SEMMA	Cascade	medium	High
CRISP-DM	Cascade	medium	High
BUSINESS INTELLIGENCE ROAD MAP	Cascade	Low	High
BIEP	Iterative	High	High
PENTAHO (BI)	Agile	Low	High

IV. METHOD

A. *Overview*

The model proposed as mentioned up to this point is a response to four facts: (1) growth of market BIS; (2) elevated rate of failures; (3) lack of a Soft and Agile Method that cover factor that lead to BI projects to fail. This method articulate practices from well – know agile methodologies such as XP and SCRUM with practices of Soft System Methodology (SSM).

B. *Phases*

The Model have five (5) phases, taken from XP, namely Exploration, Planning, Iterations and Close (**FIGURE 3**). Within the body of the exploration phase was incorporated SSM practices.

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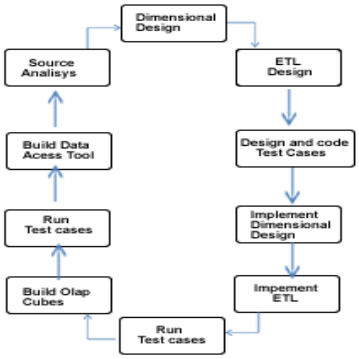
FIGURE 4. SUB - PHASES CONSTRUCTION PHASE.



C. *Roles*

Because in BIS there different component that need to be developed and the model make a division of each history by these components, the model make an specialization of developer role for each component (**TABLE 5**).

TABLE 5. ROLES.

Rol	Responsabilities
Product Owner	Define User Stories. Priorize User Histories. Drive Develoment.
Team Leader	Guide Development Process.
Data Integration Developer	Program code to neccesary to bring data from source system to target. Program tranformation rules. Treat aoutlier and missing values. Identify problem that can be solved with data mining algorithm and use them.
Data Analysis Developer	Identify ith the PO KPI indicator, and agregation need and build them.
Data Access Tools Developer	Develop user interfaces needed to interact with data
Dimensional Data Storage Developer	Build and maintain structure that will store data.
Tester	Test the system as a user.

D. *Practices*

Model merge 18 practices, 14 practices from agile methods and 3 from SSM ((a) cultural analysis, (b) logical analysis, and (c) debate and agreement base on relevant systems). In **TABLE 6** can be viewed a summary of agile practices incorporated by the model.

Among the practices being incorporated is estimating stories in points. And that each story corresponds to a dimension or a fact table. In the **FIGURE 5**, it can be seen as estimating the stories of analyzing the presence in class information for students, by school, grade and time. It is divided into four user stories, 3 for dimensions (Location, Grade, and Date) and one for the fact table (Went to Class). And estimation is performed over each story.

Another practice used is collaborative design, which is that the people in the role of Dimensional Data Storage Developer work together with Product Owner on a same board elaborating a high level design for a specific story (Simple Design). The goal is to receive immediate feedback and validation on the design being built.

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FIGURE 5. STIMATION IN POINTS

TABLE 6. PRACTICES

	Role	Description
1	Daily Meting	Each day at same time, the team meets and each member states: (1) what has been completed since the last meeting, (2) what plans to finish for the next meeting, and (3) what is getting in your way?
2	Backlog	List the characteristics or technical tasks that the Product Owner considers deliver value to the company it. They are arranged in order of highest to lowest priority.
3	User Stories	They are individual sentences made by the user to meet a need and add value to the company. A good story must comply with the principle INVEST, Independent, Negotiable, Valuable, Estimable, Small, Testable.
4	Story point	Used to express the 'size' of the user stories. And despite being a somewhat vague measure, serves its purpose which is to enable the team quickly compare stories and calculate the speed of the team.
5	Split User Stories	Divide User stories in small tasks
6	Definition of Done	Allows the entire team to have the same notion of when a task has been completed.
7	Retrospective	Developers discuss the good and bad aspect of the development cycle they just completed and brainstorm about new ways to work together.
8	Iterative & Incremental development	This means that each successive version of the project is usable, and each version is based on the above by adding functionality. Intentionally allow repetition of the software development activities.
9	Collaborative design	They consist of the design made by two or more members of the development team. Working on the same object, so that anyone can add changes and receive feedback from the changes made immediately.
10	Simple Design	Is to keep the design of software in a state that meets the needs of the moment. And do not try to predict future scenarios designs. It is associated with the principles of design: YAGNI, for "You Are not Gonna Need it. AND KISS, Keep It Simple, Stupid!
11	Refactoring	It Is the improvement of the internal structure of the source code of an existing program, while preserving its external behavior
12	Continuous Integration	Each new functionality developed, is added immediately to the entire system. With this (1) minimizing the time and errors when integrating the entire solution, (2) allows functionalities ready to be released.
13	Version Control	Manage any kind of change. One version is the state in which the product is at a given moment in its development
14	Test – led Development	First the developer writes automated test case that defines a desired behavior of the new function, produces the minimum amount of code to pass that test and then refactor.
15	Acceptance Testing	Product Owner tests if the functionalities correspond to his requirements.

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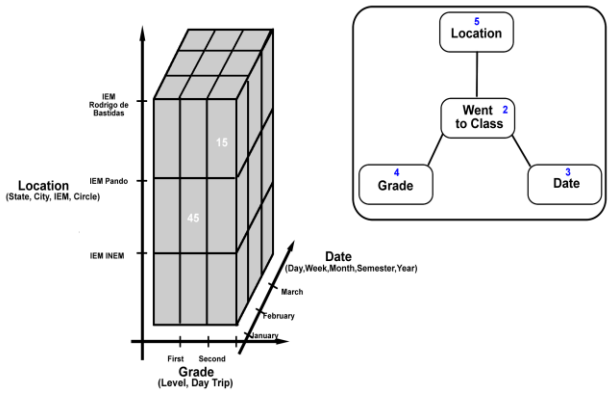

Finally, in the **Figure 6**, can view how user stories, e.g. analysis by student, are divided in tasks (Split Stories) in order to reach an increment in each component, e.g. code ETL and adapt DW, that make up BIS (Incremental Development). In addition make explicit that a user story only can be in Ready to Demo (Acceptance testing) state after integrating (Continuous Integration).

Other practices are also used but it not he purpose of this paper show how to use all of them because paper length and the authors are preparing a material with this goal.

V. Conclusions

Agile methods for development of business intelligence solutions, helping to cover many of the factors that lead to such solutions fail. But more work is required so that practices in the specific context of BI solutions emerge, and that these taken from other methods, originally designed for transactional systems, can be adapted.

The Soft Systems Methodology provides the practices necessary to the understanding of an organization during the software develop process for BIS. But it demands to be integrated in software development models.

The field of BI demands the presence of standards and high level of detail in process models in order to help to reduce the rate of fail and allow new practitioners enter in field.

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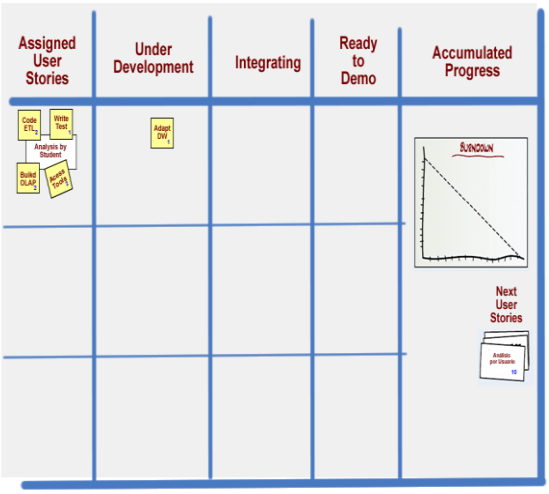
Finally, Action - Research methodology is a way to formalize the way as authors of accepted software model conceived it. Because it allow learn from practice in an explicit and recoverable way. But unfortunately its use in the field is almost zero.

Figure 6. Task Board



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