A Review of Blended Methodologies Implementation in Information Systems Development

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Abstract Many information systems development methodologies began as ‘pure’ data modelling or process modelling approaches. As they evolved, they have developed to a more blended approach. In the information systems development world, the approach is known as blended methodologies which is commonly used to fill the gaps by combining two or more methodologies as a solution. The methodologies are harmoniously combined to create something that leverages the strengths of the original methodologies including the long term before abbreviation SSADM, IE and MERISE. Thus, the aim of this paper is to contribute in exhibiting a superior comprehension of the qualities and benefits of blended methodologies through its adoption in real practice. Previous case studies from different fields were selected as a basis for findings of this study. Based on these case studies, the benefits gained from the adoption of these methodologies are discussed and recommendations for future research are discussed at the end of this paper.

Keywords: Blended Methodologies, SSADM, MERISE, IE, Information System.

1. INTRODUCTION

An information systems development methodologies are defined by Avison and Fitzgerald (1995) as a system of procedures, techniques, tools, and documentation aids commonly based on some philosophical views, which aid the system developers in their efforts to develop a new information system. Systems analysts need to identify the basic characteristics of the environment in which they are developing the information system and choose the best methodology for the development of that system. There are many different development methodologies available and Bubenko (1986) proposes that there are hundreds. In the beginning, many information systems development methodologies started as ‘pure’ data modelling or process modelling approaches. Due to the mix in human life, the social and organizational complexity, complex situations as well as technical difficulty are usually occurred. Thus, more blended approaches have been created as they fill the gaps noticed by systems developers and users alike including SSADM, IE and MERISE. “Mix and match” - the best aspects of different methodologies for different stages of the project (Avison & Taylor, 1997). For a better understanding, this paper will review the characteristics and benefits of implementing blended methodologies in information systems development depending on a previous three case studies: (1) The South Fars Power Generation Management Company, (2) University of Wollongong and (3) INRA Research Centre were chosen as the case studies and the real practice of blended methodologies were described and discussed. This paper is structured as follows: The next section reviews briefly the blended methodologies and their characteristics. Then, the case studies are described. This is followed by discussing the benefits of adopting blended methodologies. Finally, recommendations for future research are discussed.

2. OVERVIEW OF BLENDED METHODOLOGIES

Blended is commonly known as two or more things which combine harmoniously to create something that leverages the strengths and weaknesses of the original components. In the context of information systems development, a blended methodology is a methodology that has been produced by “blending” other methodologies (Kimble, 2008). They offer the flexibility to adapt the method that best suit the circumstances of a situation and should provide the advantages of a pre-defined structure without excessive rigidity. Therefore, it is argued that these approaches could prove to be both creative and effective (Kimble, 2008). There are four well-known methodologies that complement the blended characteristics in information systems development. The first methodology is Structured
Systems Analysis and Design Method (SSADM) that has been the most standard methodology in most UK government applications and can be considered as the most modern version of the traditional information systems development life cycle approach.

The second methodology is Method déduite et de Réalisation Information que pour les Systemes Enterprise (MERISE) which is a widely-used methodology for developing information systems in France and other countries, and it can be very influential according to the standards European future (Avison, 1991). The third mythology is Information Engineering (IE) that uses a data-oriented entity related approach. The characteristics of each methodology is explained in section 3.

3. CHARACTERISTICS OF BLENDED METHODOLOGIES

3.1 Structured Systems Analysis and Design Method (SSADM)

SSADM inaugurate the waterfall life cycle model starting from the feasibility study to the physical design stage of development (Shadbolt, O’hara, & Crow, 1999). One of the major lineaments of SSADM is the strong participation of the users as a requirement in the analysis phase. The users are asked to sign off each phase as they are completely ensuring that the requirements are met, the users are given a clear discretion, an easily comprehended documentation consisting of various demonstrative exemplification of the system.

SSADM breaks down a development project into stages, modules, steps, and tasks. The primarily model developed in SSADM is the data model. It is a part of the requirements gathering and it consists of well-defined stages, steps, and products. The techniques used in SSADM are logical data modelling, data flow modelling and entity behavior modelling.

In the 1980s the Central Computer Technology Agency CCTA (UK) was the main organization to investigate and assess examination and outline techniques (Ashworth, 1989). At that time, Yourdon’s methodologies were generally used and spoke to the standard for organized investigation.

Notwithstanding, the utilization of a favored standard, there was a boundless view of disappointment due to a few data innovation ventures. The vast scale innovation extends that different included government organizations had experienced this observation.

Taken a toll were normal and holes between the prerequisites and usefulness had uncovered the requirement for a standard. To decrease the expensive waste which was happening at that time, the CCTA searched for a more illustrative strategy.

The CCTA which regulates different UK government ventures, dispatched a proposition from the Learmonth and Burchett Management Systems aggregate (LBMS) as a reason for the plan of SSADM. LBMS won out more than four other administration firms and started to create a philosophy for a wholesome plan considering their earlier work. The last item was discharged in 1981 as the primary adaptation of SSADM.

The CCTA commission had required adherences for their model (Appendix A) which LBMS had poorly thought about. In 1983 SSADM was made obligatory for all administration extends in the UK.

The important characteristics of SSADM are stated in Table 1.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Dividing a project into small modules with well-defined objectives.</th>
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<tbody>
<tr>
<td></td>
<td>Useful during requirements specification and system design phases.</td>
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<td>Demonstrative representation and other useful modeling techniques.</td>
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<tr>
<td></td>
<td>Simple and easily understood by clients and developers.</td>
</tr>
<tr>
<td></td>
<td>Performing activities in a sequence.</td>
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3.2 Method d’Etude et de Realisation Informatique pour les Systemes d’Entreprise (MERISE)

According to (Borne, Romanczuk, & Stefani, 1998) the MERISE method, appeared in the late seventies, is the most used systemic method in France. It is a developmental method designed for information systems.

It enables modelling all the information used manually or automatically, which is needed to ensure the activities of a company. The goal of a systemic approach is to present a global definition of the information.

MERISE is a widely-used methodology for developing information systems in France and in other places around the world, and it may become very influential in the standard European future (Avison, 1991). There are three main cycles of MERISE approach as depicted in Table 2.

<table>
<thead>
<tr>
<th>Table 2: Cycles of MERISE approach (Borne et al., 1998)</th>
<th>Characteristics</th>
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Decision cycle also known as approval cycle consists of all the decision mechanisms, including those for choosing options, during the information system development. Decision making is a joint process concerning senior management, users and systems developers which includes the following:

- Technical choices regarding hardware and software.
- Processing choices, such as real-time or batch.
- User-oriented choices relating to the user interface.
- Identification decisions regarding the major actors of the information system and the organization.
- Financial decisions relating to costs and benefits.
- Management decisions concerning the functionality of the information systems.

The life cycle demonstrates chronological progress of the information system from its creation, through its development, till its final review and obsolescence. Each of these stages is very much characterized in MERISE. The main phases of the life cycle (Avison, 1991):

- **Strategic planning** (at the corporate level), which maps the goals of the organization to its information needs, and partitions the organization into 'domains' for further analysis (such as purchasing, manufacture, finance and personnel).

For each of these, a schedule of applications is devised to include a policy for human resources, software and hardware products, and implementing a methodology for system development. Within the frame of the strategic plan, the analysis that has just been carried out for one domain should be done for all the others, then it will be possible to understand the connection between them.

- **Preliminary study** (for the domain of interest), which describes the proposed information system, discusses its likely impact, and details the associated costs and benefits, which should be consistent with the strategic plans.

- **Detailed study** (for a particular project), of only those aspects that will be automated, including detailed specifications for the functional design (the requirements specification) and the technical design (the technical architecture of programs and files).

- **Schedules and other documentation** for development, implementation, and maintenance (all three founded at the application level).

The abstraction cycle is the key to MERISE. Unlike many alternative approaches, the separate treatment of data and processes is equally thorough and both are considered from the start. The data view is modelled in three stages: the conceptual, the logical, through to the physical (a framework borrowed from the database approach as it was originally specified in ANSI-SPARC, 1975). Similarly, the process-oriented view is modelled through the equivalent three stages of conceptual, organizational, and operational.

Each of these six abstraction levels in the abstraction cycle is a representation of the information system, and they should be consistent as well (Avison, 1991).

### 4. Information Engineering (IE)

<table>
<thead>
<tr>
<th>Characteristics of IE (Aggelinos &amp; Katsikas, 2011)</th>
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<tbody>
<tr>
<td>IE applies structured techniques on an enterprise-wide basis, or to a larger sector of an enterprise, rather than on a project-wide basis.</td>
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<tr>
<td>IE progresses in a top-down fashion through the following stages:</td>
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<tr>
<td>1. Enterprise strategic systems planning</td>
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<td>2. Enterprise information planning</td>
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<td>3. Business Area analysis</td>
</tr>
<tr>
<td>4. System Design</td>
</tr>
<tr>
<td>5. Construction</td>
</tr>
</tbody>
</table>

- Cutover IE applies structured techniques on an enterprise-wide basis, or to a larger sector of an enterprise, rather than on a project-wide basis.
- IE creates a framework for developing a computerized enterprise.
- IE then separately developed systems fit into this framework.
Information Engineering (IE) methodology is the application of an interlocking set of formal techniques for planning, analysis, design, and construction of information systems on an enterprise-wide basis (or across a major sector of the enterprise). It uses data-oriented entity relationship approach (Avison & Fitzgerald, 1995). The important characteristics of Information Engineering methodology are described in Table 3 above.

5. BLENDRED METHODOLOGIES CASE STUDIES

In this study, secondary data from three case studies of previous works are used as the basis of preliminary findings. The case studies were focusing on implementation of blended methodologies in information systems development by different companies, each case study is summarized in the following sections.

5.1 South Fars Power Generation Management Company (S.F.P.G.M.C)

The Company was originally registered under the name of SATKAB Investment Company (pjs), Corporate Registration No. 88404 in Tehran on February 5, 1992 with the aim of Investment in Power and Water Industries of the country On March 10/2004, by the Minutes of the Extraordinary General Meeting of the Shareholders, the name of the company was changed into Saba Power and Water Industries Investment Company (pjs). On June 19/2004, by the Minutes of the Extraordinary General Meeting of the Shareholders, the Type of the company was changed from "Private Joint Stocks" to "Public Joint Stocks". And on September 10/2011, the company was listed in the registered companies as "Securities and Exchange Organization" as a non-stock Exchange Publisher under No.10903. On June 19, 2004, by virtue of the Minutes of the Extraordinary General Meeting of the Shareholders the Type of the company was changed from "Private Joint Stock" to "Public Joint Stock" (Yazdi, Haddadnia, & Lotfizad, 2007).

In the following research, the accounting information system for the investigated company which had a various sub-system of accounting, payment, storage, properties, salary, and wages systems. Salary and wages systems were analyzed and developed as one of the sub-systems after identifying sub-systems problems. In both stages of analysis and designing, SSADM methodology, which has a Top-Down approach, is used. Based on the studied methodology in analysis stage, system requirements including needs (determined through studying present system problems) and obligations (determined by the designer and per experiences obtained from similar systems) were identified and by taking in consideration such requirements, the proper information system concept model was designed (Manteghi & Jahromi, 2012).

5.2 University of Wollongong Australia

The University of Wollongong (UOW), casually known as Wollongong University, is an Australian open research college situated in the waterfront city of Wollongong, New South Wales, around 80 kilometers south of Sydney. Starting 2014 the college has an enrolment of more than 30,000 undergraduate studies (counting more than 12,800 worldwide undergraduate studies from 134 nations), a graduated class base of more than 112,000 and more than 2,000 scholastic related staff.
A well-ordered connection of the SSADM approach with DRP advancement exercises is established. By adopting this approach, a smaller framework for crisis operations (DRP) can be planned in parallel with that for ordinary operations. Moreover, the use of a typical operations framework considering the investigated necessities and a crisis operations framework considering the basic business capacities can be taken after a similar line of thinking. The proposed upgrade brings advantages to both the association and the framework designer regarding consumption, self-learning, staff understanding, response time, time and capacity administration and increment of aggressiveness (Aggelinos & Katsikas, 2011). The strategy covers three of the six periods of the standard SDLC. Among the unsecured stages, the execution is the main stage that maybe ought to be incorporated, as it is concerned with establishing the framework, amid which new needs or specialized challenges that force adjustments in the underlying arrangements may emerge. With the establishment of the new framework, the association will be founded keeping in mind the end goal to accomplish its key objectives or so as to endeavor its upper hand if the framework is spearheading in the association's business (Aggelinos & Katsikas, 2011).

The advancement of a framework for crisis operation compares to the arranging, without any preparation, of a framework that will cover the association in a fiasco conditions, for a specific day and age and for lower necessities. As it were, it is a crisis operation framework that will relate to an ordinary operation framework. Its outline ought to be made in parallel with that of the typical operation framework, so that both will be administered by a similar thinking concerning needs. Thusly, the association will profit both financially furthermore in self-information, work force involvement, time of response in a framework fiasco. However, above all, in the similarity between the ordinary operation framework and the crisis operation framework (Aggelinos & Katsikas, 2011).

Enhancing the SSADM stages. SSADM follows the classic SDLC, whose enhancement with DRP activities has been proposed in Aggelinos and Katsikas (2010), as shown in Figure 2.

5.3 INRA Research Centre

The case study was conducted by INRA Research Centre where the data used for the study were obtained from three experimental farms located in central France. The MERISE method has been used in designing the information system for a research project that emphasizes the data modelling steps.
It is based on an example concerning the design of a relational database, to be used in an exploratory study of the interrelationships between production and health performances of dairy cows over their productive life. The case study consists of the collection of requirements, the construction of a conceptual data model, its conversion into a logical data model that suites a relational structure and the influence of processing trends on data models.

The MERISE method used to achieve information system modelling as the research project aims at analyzing relationships between production (milk yield, live weight), reproduction, and health performance of dairy cows, at productive life-level, with respect to factors governing performance, e.g. herd management practices or climate (Pérochon & Lescourret, 1994).

The MERISE original approach to conception comprises several steps as shown in Figure 1, which ensure a well-ordered progress, from the requirements up to the implementation on computer. The steps are the following:

1. At the **collection step**, the list of the data items and the processing of requirements are prepared.
2. At the **conceptual step**, these elements are presented in a graphical mode (data model, processing model), which is independent of any technical choice.
3. At the **logical step**, the models are translated to consider technical choices. Concerning this point, MERISE has integrated the relational database theory (Codd, 1970, 1972); that translate the conceptual data model into a relational database schema. During the conceptual and logical steps, data and processing models are checked against each other, especially to ensure that the data model will support all the application requirements (Davenport, 1978).

Collection of data requirements and of processing trends. The general idea of the data items collection according to the MERISE approach is a funnel-shaped choice on the basis of the outline specification (Pérochon & Lescourret, 1994). First, the user of the information system establishes the limits and the contents of the 'ideal' data area that meets the requirements. Secondly, the feasibility problems are identified, especially the availability of data values if the information system must be conceived depending on existing information bases. In this case study, a list of raw data items constituting the available part of the data area which was able to meet the requirements of the project was established and the chief base contained data collected principally to achieve experimental goals (feeding experiments) over the last 20 years, in three experimental farms located in central France. The chosen data items included transformed data (farm climate was reduced to a few yearly descriptors; feeding features were synthesized), and the remaining raw data. Simultaneously the rules concerning the data (e.g. any cow has belonged to one farm only throughout its productive life) were defined. Study periods and animals were chosen according to data availability for each of the experimental farms. The study periods covered the year of 1968-1988, except for one of the farms (1980-1988). About 1300 cows were retained, corresponding to about 4000 lactations and 12000 disease events. The requirements related to processing trends were included. The data collection step involved about 10 meetings with the research workers and two stages of interviews (undirecting, directing) with the farm managers. Collection and modeling proceeded in an interactive and iterative fashion, which may be frequent in MERISE applications.

Construction of the conceptual data model. A conceptual model depicts in a graphical and economical fashion (avoidance of redundancy) a reality that is composed of:

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**Figure 2:** The stages of SSADM

**Figure 3:** Theoretical steps of MERISE approach (left), adaptation to exploratory context (right).
- Data items
- The set of rules managing these data, i.e. semantic links (any cow has belonged to a farm)
- Other constraints between data (any cow has belonged to one farm only throughout its productive life)

The initial construction of the conceptual data model for this case study is illustrated in Figure 2 that consists of construction of objects, construction of relationships, and representation of cardinalities. It shows the importance of constructing relationships correctly.

![Figure 2](image)

**Figure 2:** Construction of the conceptual data model for this case study.

From the conceptual model to the logical data model in the relational context. The MERISE rules that allow users to convert the conceptual data model into a relational database schema (set of 'relations', also called 'tables') are largely determined by maximum cardinalities and a major part of these rules were useful in the framework and presented in this case study as following:

![Figure 3](image)

**Figure 3:** Transition rules to convert conceptual objects and relationships into logical tables in the relational context: (A) case of a son object in a son-father relationship; (B) case of relationships with maximum cardinalities of n, containing attributes or (C) not containing attributes.

6. DISCUSSION

Based on the implementation of blended methodologies in information systems development of the case studies, there are various benefits gained and discussed in Table 4.

<table>
<thead>
<tr>
<th>Company</th>
<th>Benefits</th>
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</thead>
<tbody>
<tr>
<td>The South Fars Power Generation</td>
<td>More access for the users (power plants managers) to the present integrated system in headquarters (Shiraz) which has led the company to success in informatics section to reach the objective of integrated systems creation.</td>
</tr>
<tr>
<td>Management Company</td>
<td>Bilateral relation between present sub-systems was improved between accounting sub-system and wages and salary, storage, liquidities, and properties.</td>
</tr>
<tr>
<td></td>
<td>The Company's various geographical parts dispersion were addressed in creating communicative and information networks.</td>
</tr>
<tr>
<td></td>
<td>Duplications reduction in the present integrated system were addressed.</td>
</tr>
</tbody>
</table>

![Table 4](image)

**Table 4:** Benefits of Blended Methodologies Implementation
This table discuss about the using of blended methodology in real life scenario, the organization mentions all the steps for the implantation and the benefits they gain from that as shown above.

7.RECOMMENDATION AND DIRECTION FOR FUTURE RESEARCHS

There is a little number of articles published explaining the blended methodologies dearly, we recommended the future research’s for to choose an organization and implement the methodologies, then according to the results will be very dear the best for use it also, the advantages with disadvantages will be recorded.

8.CONCLUSION

The adoption of blended methodologies can increase the profitability and the reliability of information systems development due to the complex situations as well as technical difficulty. The strongest argument is they are more in tune with the reality of systems development. They offer the flexibility to adapt the method to suit the situations and provide the advantages of a pre-defined structure without excessive rigidity. This paper proved the statement by reviewing the selected case studies and understanding the benefits gained by the organizations through the adoption of blended methodologies. For further research, it is suggested that more case studies of blended methodologies implementation need to be conducted to achieve better understanding of the methodologies.

9.REFERENCES
