Qualitative Assessment of User Acceptance within Action Design Research and Action Research: Two Case Studies

Edison Fernando Loza Aguirre and Alex Fernando Buitrago Hurtado

***Abstract*—Nowadays, there are several models to evaluate technological acceptance of software developed through Action Design Research and Action Research. These models rely on quantitative techniques to study user behavioural intentions and thus predict the use of a technology. This paper presents our experiences in using qualitative methods to assess such acceptance in the development of specialized tools for Strategic Scanning. Our study suggests that qualitative methods can be an alternative to evaluate technology acceptance in situations where the number of users is small or where there are requirements for continuous improvement.**

***Index Terms*— Action Research, Action Design Research, user acceptance, qualitative methods, strategic scanning**

I. Introduction

SINCE the beginning of the decade of the 1990s, research in Information Systems (IS) began to integrate two seemingly disparate approaches: on the one hand, a conceptual approach, which focuses on the production of theoretical contributions. On the other hand, a practical approach, which focuses on solving problems that practitioners must face in their own environment and context [1,2]. This led to the propagation of research based on methods known as Action Research (AR), in which scientific knowledge is obtained as a result of studying the effects of an action taken with the intention of solving an existing problem in a particular social setting [3].

In recent years, a new research paradigm has evolved. It introduces the principles of Design Science (DS) to AR methods. DS advocates for the use of artifacts as a communication means between research participants and also as a mechanism to diffuse its results [4]. This new paradigm, called Action Design Research (ADR), proposes the development of technological artifacts to facilitate intermediation between professionals and researchers as well as the appropriation, intervention and validation of theoretical concepts in practical situations [5].

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In both AR and ADR, the evaluation of the implemented solutions plays a decisive role in the research process. Such evaluation can be based on terms of functionality, completeness, consistency, accuracy, performance, reliability, usability, or adaptation to the organization [4]. Among these, gain user acceptance is a key factor for obtaining satisfactory results for both researchers and practitioners. Several models have been developed to measure the acceptance of technology focusing exclusively on quantitative techniques. Still, developers interested in using such models may face difficulties when applying them to scenarios in which the number of users is reduced. Difficulties emerge, for instance: in specific developed tools for scientific research, systems using emerging technologies, or early versions of commercial software [6,7]. Additionally, these models tend to limit the possible responses of users, which does not allow to exploit the assets of information that can be obtained by a less restrictive approach and that could lead to new theoretical contributions for the model itself [6.8].

This article presents the results of the application of qualitative methods as an alternative to the use of quantitative methods when evaluating technological acceptance. Conclusions were obtained by applying AR and ADR paradigms in two case studies. The article is organized as follows. Section II is a revision of academic literature about AR and ADR methods and models of technological acceptance. Section III presents two case studies in which a qualitative assessment was used to evaluate acceptance. They report observations from the development of two Strategic Scanning (S.Scan) oriented systems. Finally, conclusions, limitations and research perspectives are proposed in section IV.

II. Literature Review

AR aims to study the organizational changes that arise from the implementation of an action intended to solve a practical problem. The solution to the problem is the result of a joint effort between researchers and practitioners ensuing in the creation and/or appropriation of knowledge from all participants [3,9]. However, although certain methods of AR aim to produce changes by developing a computer system, AR is not a methodology focused exclusively on developing such tools.

DS focuses exclusively on the production of knowledge through the construction and use of an artifact [4]. Since artifacts can be developed in DS without the existence of a practical problem to solve or the execution of validation tests in real environments, an interaction with AR was proposed to take advantage of both paradigms: from AR, its practical problem-solving orientation and its reflection mechanism for producing knowledge; and from DS, its orientation for designing and evaluating artifacts. This interaction is known as ADR [5].

In both AR and ADR, evaluation of the resulting system is an important part of the methodology. Among the various techniques that can be applied to this stage, assessment of user acceptance is one of the most used. It focuses on capturing perceptions as a mechanism for predicting the future use of IT. These concepts are detailed in this section.

A. *Action Research*

Widespread used in IS research, AR became popular thanks to the works of Avison, Baskerville, Myers and Wood- Harper (i.e. [3,10,11,12]) who contributed to developing and structure AR in the field of IS.

AR is based on the researcher conviction that a particular problem cannot be studied by other methods (i.e. questionnaires, case studies, observation). Consequently, only the introduction of an action would allow a greater understanding of the problem and its solutions [10]. Unlike other methods, the AR researcher seeks to produce an organizational change while he studies the changing process [3]. These changes must be based on the adaptation of academic theories into practical concepts applicable to a particular organizational context in order to both solve a problem and feedback to the theoretical knowledge [13]. AR is recognized as a strategy of practical change due to its aims of improving practices and situation of participants [9].
AR is a five-stage cyclic process (Fig. 1):

1) Diagnosing. Identification of the main problems.
2) Action planning. Specifying actions to improve or solve identified problems. A theoretical framework should guide this stage.
3) Action taking. Implementation of the action planned through active intervention in the participating organizations.
4) Evaluating. Joint evaluation of the results by researchers and study subjects.
5) Specifying learning. Identification of new knowledge for the scientific community as a result of the success or failure of the actions taken or from the use of the theoretical framework.

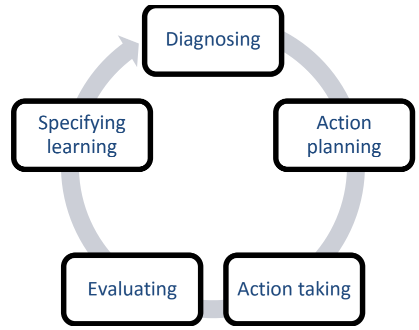

Fig. 1. AR process model [14]

TABLE 1
AR FORMS INVOLVING THE DEVELOPMENT OF AN IS [3]

		IS prototyping	Multiview
Process model	Iterative. Continuous repetition of AR cycle.	✓	
	Linear. Tasks executed in simple sequence.		✓
Typical involvement	Collaborative. The researcher is an equal co-worker. The study tasks are shared without distinction.	✓	✓
	Facilitative. The researcher is an expert helping the subjects with expert advice, technical knowledge or independent viewpoint.	✓	✓

Changes are executed in a collaborative environment that involves both researchers and practitioners. As a result of this, knowledge of all participants is increased [12]. Thus, alternatively or simultaneously, the researcher adopts the role of a participant observer (describing, understanding and analysing the organization that is studied in its own environment) and an actor (participating, guiding and influencing the behaviour, understanding and actions of the organization intervened) [3].

While there are other recognizable AR forms (i.e. canonical AR, action science, participant observation, action learning), Table 1 presents only those whose main objective involves the development of an IS.

B. *Action Design Research*

ADR proposes a new way of thinking and conducting research using a data artifact as a central element for solving the initial problem. This reduces the gap between theoretical knowledge of researchers and practical knowledge form practitioners. Thus, ADR pursues four goals [5]:

1) Proposing an approach in which scientific knowledge is the basis for shared conceptualization and development of an artifact.
2) Finding new theoretical knowledge by using the artifact in a particular organization.
3) Allowing practitioners to solve problems.
4) Providing guidance for integrating the concepts of DS with the principles of intervention of AR.

Generally, artifacts are constructs, models, methods or other adapted instances. These artifacts should be the instruments solving those problems that have not yet been solved or providing better solutions than the existing ones [4]. The term computing artifact corresponds to a special type of artifacts embodying constructs, models and/or methods in a physical implementation [15].

The ADR process consists of 4 stages and 6 principles (Fig. 2). ADR follows a cycle based on collaboration and adaptation. Initially, the researcher assumes an exploratory to elucidate the problem of the organization allowing then to plan an intervention. Next step is intervention, firstly designing and constructing a computer artifact. This artifact will occupy centre-stage during the implementation period in which: behaviours are observed and data is collected. The data collected are analysed at the end of intervention and, depending on the results, it may require planning new intervention strategies. The planning-execute-analyse-formalize process can be repeated iteratively until the researcher gets to a sufficient understanding of the problem and implement a solution fixing it.

The results should be validated from three perspectives: (1) the researcher, focusing on the theoretical or conceptual contributions, (2) the practitioner, concerning by practices and tools that improve the quality and productivity of his work, and (3) a methodological perspective regarding the improvement of rules for designing new devices.

ADR was conceived as a method to ensure teamwork in a group with several complementary roles (i.e. professional experts, researchers). This allows that the interests of all the participants could be reflected in the results.

C. Evaluating User Acceptance

The successful introduction of an information technology (IT) has been historically studied in two research approaches that, although developed in parallel, were never reconciled: user satisfaction (i.e. [16,17]) and user acceptance (i.e. [18,19]). From these two approaches, the latter has attracted more the attention of researchers mainly because of its ease of use and its focus to studying the effective use of IT.

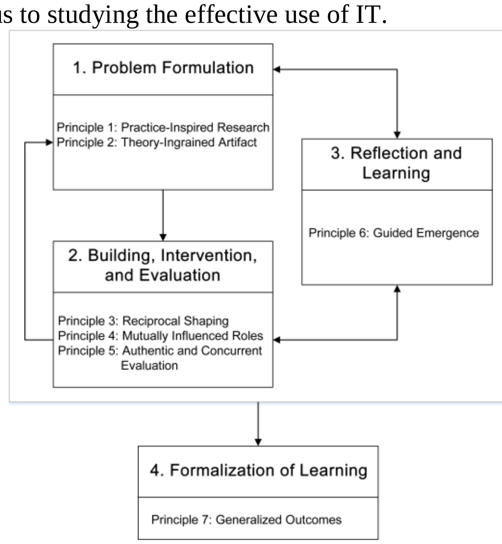

Fig. 2. Stages and principles of ADR [5]

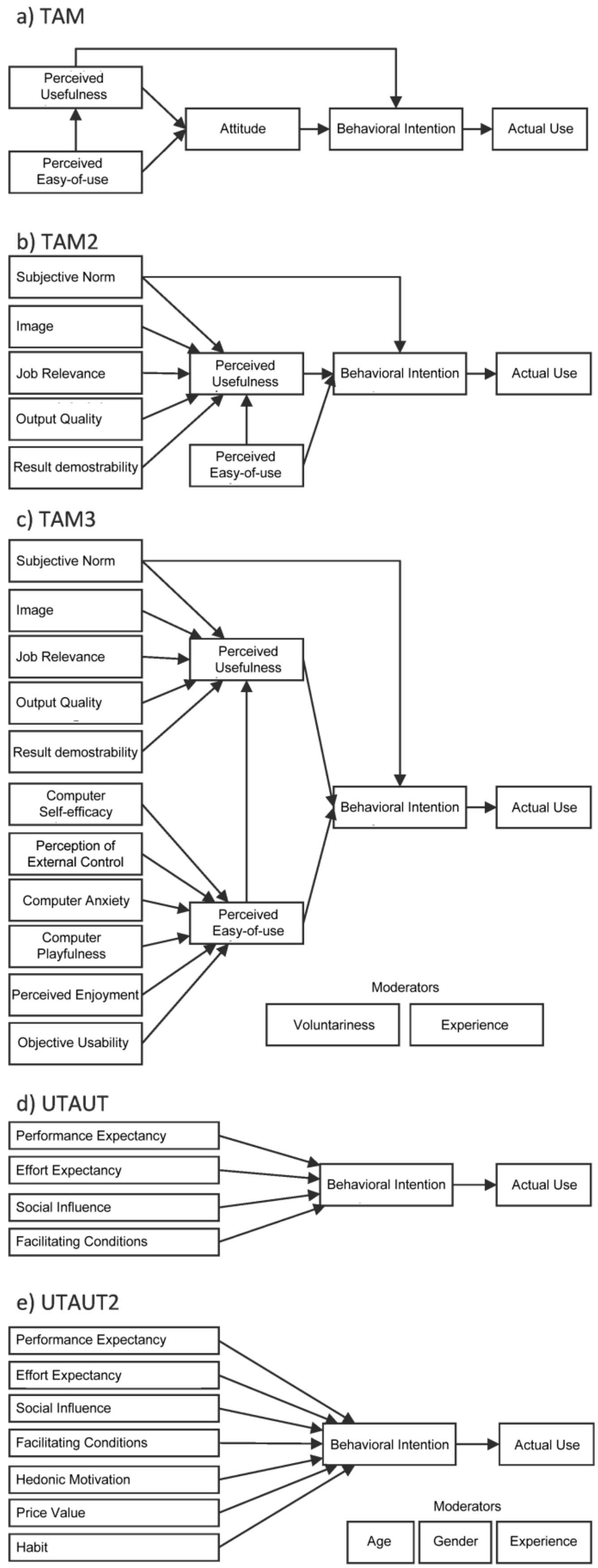

Fig. 3. IT acceptance models

The study of technological acceptance has its origins in the difficulties experienced in the early 80s with the refusal of some users to voluntarily use the ITs that were designed to assist them in their daily tasks. Since then, the understanding of acceptance has been developed mainly thanks to the models proposed by Davis, Venkatesh and others (Fig. 3): Technology Acceptance Model (TAM) [18], TAM2 [20], TAM3 [21], the Unified Theory of Acceptance and Use of Technology (UTAUT) [19], and UTAUT2 [22].

These models were developed based on the Theory of Reasoned Action (TRA) [23], and its extended version, the Theory of Planned Behaviour (TPB) [24,25]. These socio-psychological behavioural theories state that the perception of a person over the consequences of an action or behaviour can predict his future actions. The individual perception depends, for its part, on individual beliefs and behavioural predispositions [26]. On this basis, TRA and TPB have allowed to explain individual actions and behaviours in different disciplines.

The application of these theories in IT is justified by the idea that to increase the use of IT, the first thing to do is increase its acceptance by users. Such acceptance, according to TRA and TPB, will depend on the intention of individuals to use IT. Knowing the factors that influence this process, enables organizations to take actions in order to promote acceptance and therefore the effective use of IT.

In TAM, authors sought to establish the criteria for understanding the behavioural intention of the use. They found that this intention is influenced by an individual attitude that has two determinants: perceived usefulness and perceived ease of use. TAM2 expanded the original model including a detailed explanation of the forces that influence the perceived usefulness, while TAM3 focused on detailing those that influence perceived ease of use. In turn, UTAUT, and its expansion UTAUT2, add a vision of how the determinants of intention and behaviour evolve over time thanks to the incorporation of elements from other theories: Social Cognitive Theory [27] and the Theory of Diffusion of Innovations [28]. Thus, these two models helped redefine several concepts of TAM and provided new determinants to the understanding of behavioural intention.

Over the years, these models have been largely used to explain user acceptance in systems designed for mass markets. However, several researchers have pointed out its limitations as tools for explaining the acceptance in other types of conditions and scenarios [7.29]. Therefore, the study of the applicability of these models in some particular situations (i.e. highly specialized systems, prototyping) can facilitate the understanding of different determinants and relationships, and consequently it opens an opportunity to improve the models themselves [6].

Many of the criticisms of acceptance models rely on its exclusive focus on quantitative methods [8, 30]. This approach has conferred strength to these models (i.e. universality, reliability of results), which explains their recurrent employment on scenarios of generic software development (i.e. homogeneous massive systems easy to use and independent of the score or the user role) [6]. However, the panorama of applicability of quantitative methods is complicated for other settings.

Thus, the use of qualitative methods can be presented as an alternative. Qualitative methods have several advantages: (1) they are applicable to environments where the number of users is reduced, (2) they give an insight into other aspects that are not necessarily covered in a questionnaire or are difficult to quantify [31]; (3) they provide rich description of the perceptions of users and on their social and cultural contexts [32, 33]. This is why we present below our experiences using such methods in the evaluation of acceptance of S. Scan systems.

III. Case Studies

A. Research context

An organization is not exempt from the changes and evolution that may occur in its socio-economic environment. This is the reason why organizations conduct, to a greater or lesser extent, S.Scan activities in order to: keep up with the developments and trends of its environment [34,35], identify new threats and opportunities [36], anticipating changes and understand the forces that engender them [37,38], reduce the risks arising from uncertainty [39], and support their decision making [40]. S.Scan has been defined as: "the acquisition and use of information about events, trends, and relationships in an organization's external environment, the knowledge of which would assist management in planning the organization's future course of action" [41]. This process of acquisition and use of information is modelled as shown in Fig. 4.

Once managers encounter a problem that can involve a strategic decision, they proceed to the identification of the part of its business environment to be monitored in order to collect information related to the problem. As this is done, a stage of selection of information is performed in order to identify the relevant information and save it in a database. Executives then interpret this information during collective meetings before circulating the results to the people who can implement actions.

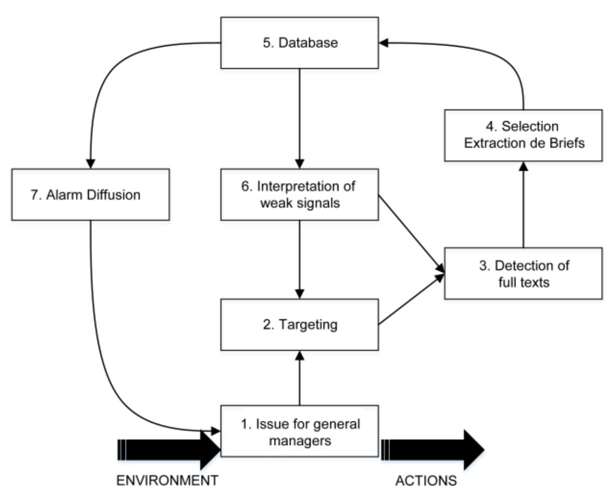

Fig. 4. S.Scan process [42]

This article presents our experiences in the qualitative assessment of the acceptance of two software tools developed within a research team of the Centre for Studies and Applied

Research in Management (CERAG) of the University Pierre Mendes France. The tools correspond to steps 2, 3 and 4 of S.Scan process presented in Fig. 4. Acceptance of both tools was evaluated in real interventions within the framework of AR and ADR as detailed below.

B. TargetBuilder

The objective of the targeting stage of S.Scan relies on defining and delimiting the parts of the external environment that represent, at any given moment, a critical priority for the organization [43]. Limiting the scope of the environment is important in S.Scan because a very large spectrum can lead to: an overload of information [44], ignore important information [45,46], or the failure of the S.Scan project [47]. TargetBuilder is a tool that was conceptualized to help managers to target S.Scan.

1) Context

The implementation of Sustainable Supply Chains (SSC) is a subject of great interest for the scientific community and industry. However, collect information on S.Scan for SSC is complex due to the crosscutting nature and the broad spectrum of issues involved [48,49] Therefore, developing and or improving methods to assist managers to target S.Scan in this context is crucial. Thus TargetBuilder was developed as part of a research project whose purpose was to find ways to help managers implement S.Scan in order to implement SSC initiatives. The project was funded by the French Agency for Environment and Energy Management (ADEME) within the research program for transport PREDIT 4.

2) Intervention Process

TargetBuilder was implemented following the IS prototyping method, which is part of the AR family. The method includes an iterative process of prototyping and evaluation that is repeated until the tool meets the objectives for which it was designed [3]. TargetBuilder was developed following the steps given below:

a) Diagnostics

The objective of this stage was to identify managers' information needs in order to perform S.Scan for SSC. This task was carried out through interviews with 50 executives within 42 organizations from different sectors. As a result of this stage, it was concluded that there was a need for developing mechanisms that would facilitate targeting S.Scan in such context, which was considered as very extensive and crosscutting, and where the collaboration of actors from different organizational units was also required.

b) Action Planning

In order to solve the difficulties encountered in the diagnosis stage, an existing S.Scan targeting method [43] was adapted on a system from the family of Group Support System. We choose meetings room system to facilitate face-to-face interactions [50]. The system should allow the identification of actors and topics and to for S.Scan in SSC context, but would be applicable also in other contexts. A target matrix will then interconnect the actors and topics to scan. Then they can be prioritized and filtered using two criteria: the current capacity of the organization to gather information about a pair topic-actor, and the perceived relevance the pair in the short-, medium- and long-term.

c) Action Taking

This stage included the implementation of improvement of a prototype through interventions in organizations interested in staring S.Scan in SSC context. The prototype was implemented as a web tool based on a three-tier architecture using a server that combines Apache, AJAX, PHP and MySQL. The tool has two modules: the Actor/Topic Manager and the Target Matrix editor. Examples of interfaces of both modules are presented in Fig. 5 and 6.
The tool was tested and improved due to interventions in the headquarters of 10 organizations involving 27 executives. In each of the interventions a S. Scan target was identified using TargetBuilder as support. Following a participant observation approach [3], all the meetings were recorded and transcribed for later analysis. The interventions were performed until a saturation point in which the system was validated as useful for S.Scan targeting. In total, four iterations were required to achieve this state as shown in Fig. 7.

d) Evaluating

As part of the system evaluation, a discussion about its acceptance was included at the end of each intervention. Questions were established based on TAM model. The responses collected were then subjected to a thematic analysis. The details of this evaluation are provided in the section III.B.3.

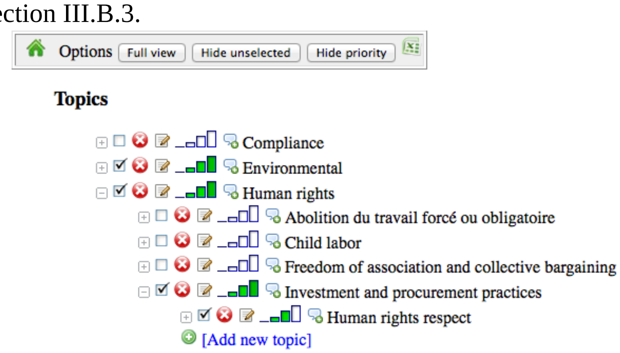

Fig. 5. Actor/Topic Manager Module

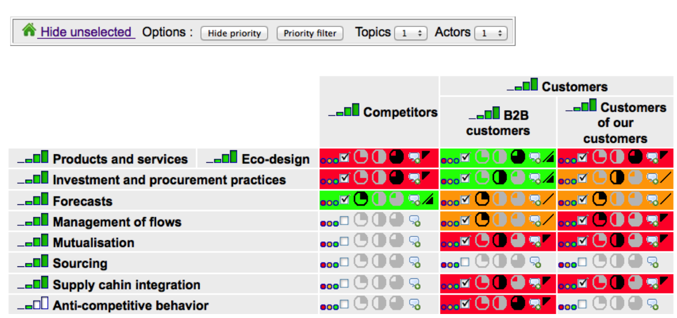

Fig. 6. Target Matrix Module

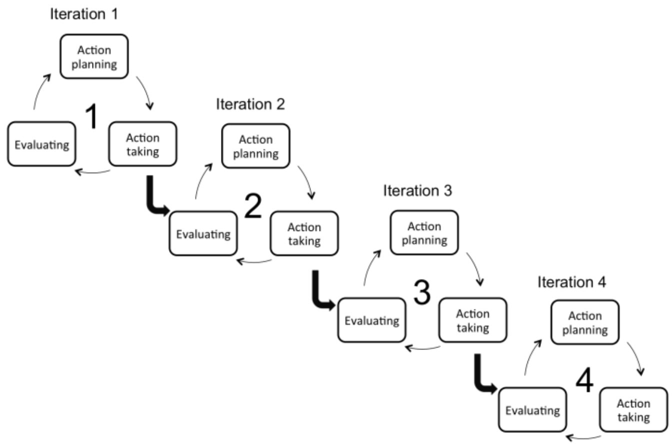

Fig. 7. AR iteration for TargetBuilding development

e) Specifying Learning

Thanks to the interventions using TargetBuilder, it was possible to propose improvements to the chosen method for S.Scan targeting [51]. Some of them were introduced as a result of suggestions from participants. Consequently, by developing TargetBuilder it was possible to capitalize on new scientific knowledge as well as a system that solved the need for supporting managers to identify targets within S. Scan for SSC.

3) Qualitative assessment of the acceptance of TargetBuilder

To qualitatively assess the acceptance of TargetBuilder, the first step consisted of coding transcripts of meetings. At the end of each intervention, a discussion was engaged about the usefulness and easy-of-use of TargetBuilder for S. Scan targeting. Also, coding included all those passages of the transcripts in which users expressed their criticisms and suggestions to the system. Thus, the coding was performed on the basis of three categories: positive reviews, negative criticism and suggestions for improvement. The first two were used to measure acceptance, while the third was used for making improvements at each AR iteration.

Two researchers independently coded the transcripts. The inter-coder agreement rate was calculated based on the number of agreed encoded fragments in relation to the total number of encoded fragments [52]. The resulting rate was 83.8%, which exceeds the required minimum of 70% for this type of study [53].

Coding results were used to assess the evolution in user acceptance as result of improvements made to the system in each phase. As shown in Fig. 8, the positive reviews tended to increase. Quite the contrary negative reviews tended to decrease.

Later, the coded elements were compared with the two criteria of TAM: perceived ease-of-use and perceived usefulness [18] where: the first concerns the degree to which a user believes the use of TargetBuilder does not require much effort. The second is the degree to which a person believes that using TargetBuilder can increase his performance in identifying the S.Scan target.

As can be seen in Fig. 9, TargetBuilder was assessed positively in terms of perceived usefulness. This suggests that users considered that the tool is useful for the task of identifying targets of S.Scan. As illustrated by one of the participants: “I like it because it’s visual, it’s functional, it’s interactive and not boring at all. I think that if we have done it with paper and pencil, it would be more tedious and time consuming” [Intervention 08].

Regarding easy-of-use, it was more difficult to assess. On the one hand, the tool was operated by one of the researchers during interventions. Consequently, there was no direct contact between the end user and tool. On the other hand, since many suggestions for improvement had to do essentially with interface improvements, easy-of-use perception changed as interventions proceeds.

4) Lessons Learned

Our results allowed a visual assessment of the system acceptance in an environment where it would be impossible to survey because of both the small number of participants and the principle of continuous improvement used in its development. The coding and use of participants’ recommendations for improvement allowed obtaining best reviews of the tool as interventions proceeds. With the application of the concepts of the TAM model it was possible to evaluate the acceptance in relation to perceptions of usefulness and ease of use, and therefore we were able future venues for research focusing on improve the perceived ease-of-use on the basis of TAM3.

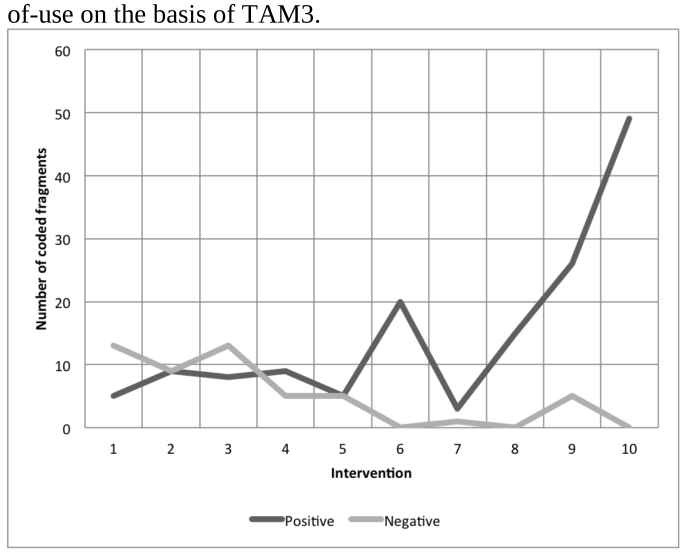

Fig. 8. Criticism evolution per intervention

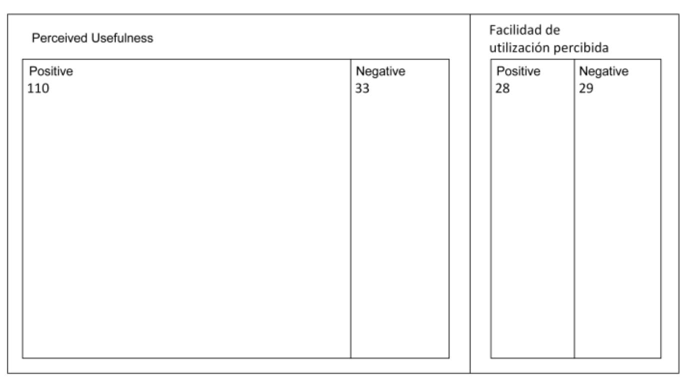

Fig. 9. Criticisms by acceptance criteria

C. Aproxima

Aproxima is a computer artifact built to support an ADR research. This tool implemented several S.Scan concepts for finding relevant information available on the Internet. These concepts are framed in research topics concerning S.Scan and weak signals. The purpose of Aproxima is to serve as a bridge between organizations and researchers in disseminating search and selection of information techniques useful to implement a continuous process of organizational intelligence.

1) Context

The Colombian Direction for Fiscal Support (Dirección General de Apoyo Fiscal, DGAF) is an agency of the Colombian Ministry of Finance and Public Credit. It is responsible for support regional and local governments to: strengthen their tax and financial processes, monitor their fiscal status and use of national founds, and adopt fiscal consolidation and control programs.

DGAF requires financial and background information from each territorial agency in order to anticipate potential problems preventing compliance with their services providing to the community. The financial information is easily accessible through territorial agency reports or through an IS developed by the Colombian government. However, background information is not easy to obtain. It relates to political, demographic, natural, financial and legal factors that may generate a fiscal risk. Our interest was focused on developing an IS to obtain such information and properly distributed to the various executives of the DGAF.

2) Intervention Process

The research followed the steps of the ADR method in two iterations. The problems associated with the first iteration were to demonstrate the usefulness of digital press as relevant sources of information for DGAF. The second iteration focused on the problem of processing and distribution of collected information.

a) First iteration

(1) Problem formulation

Initially, efforts were made for obtaining information that could support the DGAF decision-making process for avoiding misusing public funds.

In Colombia, regional and local newspapers are a large source of information. Most of them are digitized and are accessible via the Internet. News of interest to the DGAF corresponds to the communication about public projects. It includes the views of local journalists, the impact of projects in the region and the perceptions about the financial and political management of the project. However, exploiting this information is not easy. The large amount of published information may generate a data overload and this limit its use. Additionally, the solution was to take into account that DGAF requires anticipatory information and not historical information. Also due to their limited time, decision makers required short and concise pieces of information. Therefore, the problem of this iteration focused on mitigating data overload and demonstrating Internet usefulness as source relevant information.

(2) Building, Intervention and Evaluation

In order to find a solution to the problem of information overload, a version of Aproxima was implemented in the DGAF. The aim of the device was to extract full texts from Internet sites of Colombian regional newspapers and present them in a concise form.

Our efforts focused on automatic collection of a “brief of information” [54], which is the result of extracting keywords from each of the full texts. In order to be useful in our study, these keywords were related to an anticipatory signal [43]. Thus, briefs of information were built grammatically from structures representing future actions and keywords associated with a specific theme.

After the development of the system, it was carried out an intervention in two DGAF financial subjects: (1) monitoring of budget authorizations and (2) changes in fuel legislation and their potential impacts on a territory.

(3) Reflection and learning

As a result of the intervention, the artifact demonstrated its utility as a tool for automated extraction of briefs. But its usefulness was limited since the implementation depended on the constant intervention of the researcher. Although the participants perceived the potential of the system outcomes, they suggested improvements on autonomy and distribution of information.

(4) Formalization of Learning

As conclusion of the first iteration of the research process, we were able to demonstrate that digital newspapers could be a relevant source for S.Scan if we are able to extract relevant information from a large body of data information. A second iteration was planned to improve the shortcomings of the first implementation.

b) Second Iteration

(1) Problem formulation

A frequent problem in the conceptualization of decision support systems is the lack of criteria for the appropriate presentation of information. It is necessary that the information can be presented in a concise, short and meaningful way when such information is addressed to decision-makers [44]. Thus in this second iteration, our efforts focused on improving ease-of-use and autonomy [55].

(2) Building, Intervention and Evaluation

The new iteration of our artifact integrated concepts of data overload [56] on the basis of the multidimensional concept of data overload [57]. After its construction, the artifact was used in a one-year intervention in DGAF. 44 members among experts, managers and external consultants participated in this intervention. A case study observation [4] was followed for the evaluation of results. The details of this evaluation are presented in section III.C.3.

(3) Reflection and Learning

From the analysis of our intervention, we could identify positive and improvement aspects for Aproxima. These results are presented in section III.C.5.

(4) Formalization of Learning

Thanks to the intervention carried out with Aproxima, it was possible to identify practical and theoretical contributions. On a practical level, specialists and contractors of DGAF found the artifact as a helpful tool. It enabled them to be more reactive as well as allowing them to stay informed about the daily work of local and regional authorities. On the theoretical level, it was possible to improve the understanding of the brief of information and its importance in S.Scan.

3) Qualitative Assessment of the Acceptance of Aproxima

Case study process using a computer artifact was developed by Runeson and Höst [58] and is presented in Fig. 10. The first stage is the design of the case study by defining objectives. The second corresponds to the preparation for data collection in which the tools are designed and to enable data collection. The qualitative analysis started with the construction of a coding guide that, in our case, was based on TAM2 [20]. For coding and data management we used Nvivo. The result of our coding is presented in Fig. 11 on the form of a surface diagram.

From our thematic analysis, the most important positive outcomes for Aproxima were: its relevance, its usefulness for dealing with information asymmetry, its interaction usefulness, its usefulness to complement already known information, and the ease of extracting information. The most frequent negative aspects were: deficiencies in the organization of information, misrepresentation, deficiencies in filtering relevant information, and the low credibility of some sources. With respect to the resulting information, it was considered easy to read and interpret, which facilitated its immediate use. Such use is reflected in the aspects shown in Fig. 12. The information obtained was considered in most cases as rich and diverse in content.

Easy-of-use and autonomy are aspects that still require work. With regards to ease-of-use, the presentation, format and organization of the information were suggested, by most of the users, as opportunities for improvement. On the side of autonomy, there was identified some improvement opportunities concerning thematic organization of information and information filtering by subjects, keywords and sources.

4) Lessons Learned

Qualitative analysis has not only enabled us to assess the computing artifact through the criteria of TAM2, but it has also allowed us to explore new possibilities of use of the artifact. The depth that provides thematic analysis grants not only an exploration of ease-of-use, but also deals to the very effective use. Its effective use is demonstrated by the actions that users take thanks the exposure of the information provided by the computing artifact.

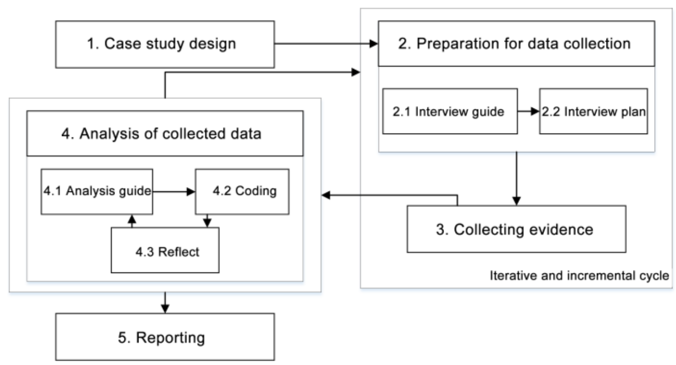

Fig. 10. Qualitative assessment process [58]

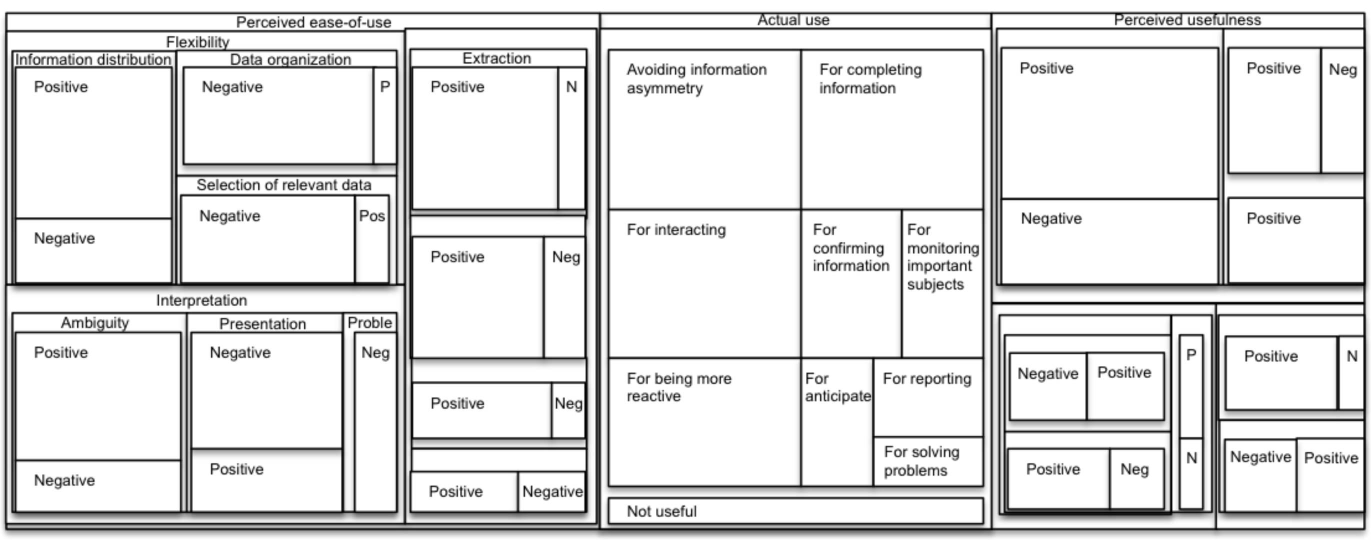

Fig. 11. Coding surface diagram

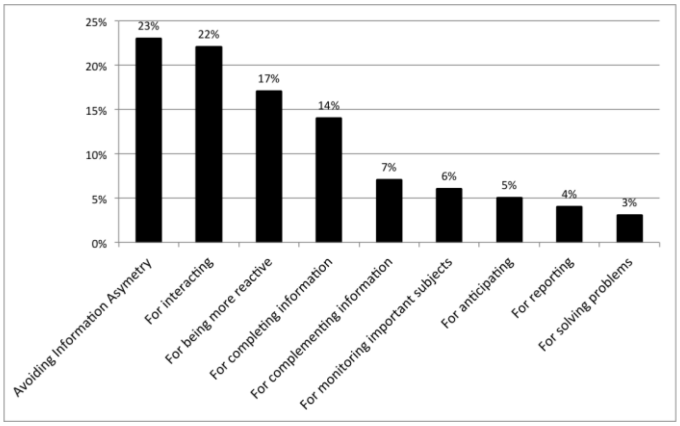

Fig. 12. Use of information in practice

IV. Conclusions, Limits and Perspectives

This study is one of the first contributions on the use of qualitative methods to assess the technological acceptance. The application of these techniques has enabled us not only to evaluate acceptance based on the existing models, but also to exploit into the wealth of the information collected during assessments in order to improve the functionality of the tools developed. The use of qualitative methods identified design problems related to ease-of-use of both tools. We were able to going further on these problems and to facilitate user feedback in order to recognize improvement aspects to be implemented in each tool in the future.

From our experience, we can conclude that the application of the techniques of qualitative analysis is an alternative to measure technology acceptance in cases where the number of users is reduced or where continuous improvement is a requirement for development. However, these methods should not be considered as opponents of quantitative methods, but rather, both should be seen as complementary. In fact, the strength of a quantitative study can be complemented with the ability of a qualitative study to exploit and deepen the evaluation aspect not commonly arisen through the use of quantitative methods. Quantitative-qualitative applications are an interesting research perspective in the field of technology acceptance.

Finally, the results presented in this article correspond to the qualitative assessment of the acceptance made in the development of applications for S.Scan. Future efforts may focus on studying its applicability in other cases and to develop specific procedures for this type of evaluation.

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