

Exploring Actability Dimensions in Practice: A Critical Evaluation

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Abstract

Traditionally, information systems are used to store, retrieve and manipulate data for the business needs of their users. Currently, however, there is a shift in the primary usage of systems to facilitate many more of the everyday activities of a larger, mainstream population of users. Many traditional methods of information systems design embody a data-driven approach to modelling the real-world and represent this model in the system. It has been argued that this strategy tends to neglect the action requirements of the users, resulting in systems that do not provide the necessary support for their social action. Therefore, there is a need for new systems that act as tools for social interaction, and, accordingly, for design concepts that support the development of such systems. Actability is one such concept and the aim of the reported research was to analyse critically the principles of actability in use. These principles were used in a case study to evaluate an information system to investigate possible weaknesses of traditional systems' support of social action. Following this, the principles were used to examine a new system's improved support for its users action needs. This research approach made it possible to show what actability adds to the field of social information system evaluation, design and implementation. It was shown that the traditional system failed to provide the action potential of its users in an acceptable manner. The actability dimensions were then used to design a system that explicitly supported the provision and recording of the social actions required by its users. Altogether, the results clearly indicate that there is indeed added value to be gained from the principles under scrutiny and that continued research into making these more practically useful is worthwhile.

Keywords: actability, evaluation criteria, IS evaluation, design, heuristics, social action

1 Introduction

Traditionally, information systems were used to store, organise and retrieve large amounts of data in organisations, to help their users make knowledgeable decisions (e.g. Flores 1998, Lyytinen 1987, Goldkuhl and Ågerfalk 2005). Consequently, the methods of information system (IS) design tended to focus on the users' desires to manage their data, and systems were designed accordingly. Over time, however, the technological world has experienced rapid transformations and with this has come a change in the usage of information systems. Not only do they provide data manipulation, they also assist with the requesting and gathering of information, the sending and receiving of messages between the different actors, and the performance of many other user actions incorporated within the supported business context. This is a shift in IS usage to that of the provision of support for social actions (i.e. purposeful actions that take into account the behaviour of other actors). This integration with everyday activities brings a need for new information systems that act as tools for social interaction.

However, the designs of these new information systems have often not experienced the same shift in thought to reflect the change in their usage. Designers are still modelling the data handled by the system without paying enough (if any) attention to the social and communication actions of their users (Ågerfalk and Eriksson 2004). A possible cause is that designers are basing their designs on the principles of generating tools for data manipulation and processing without focusing on the user's social interaction with other users, through the

system. The resultant designs are hence fundamentally data-driven rather than action-driven, which does not facilitate the performance of social actions. Recent research into the social action support of information systems suggests that these systems are often not accommodating their users' action needs (Ågerfalk 2004, Ågerfalk and Eriksson 2004, Goldkuhl 2005, Goldkuhl and Ågerfalk 2005).

The concept of actability (Goldkuhl and Ågerfalk 2002) has been derived to encapsulate the idea of developing information systems that embody the social action needs of those that intend to use them. A system's actability is its ability to permit the performance of its users' communication actions through it in a useful and meaningful manner. From this a number of 'actability dimensions' (Ågerfalk 2004) have been formulated so as to be used as a tool to assist during IS design and evaluation. First, they have been suggested to be used for evaluating existing systems to identify strengths and weaknesses at supporting users' action needs. The results of these evaluations are then to be used as a means to increase their action support. The dimensions have also been suggested to be used to guide the design phase of new information systems to enable the incorporation of the principles of actability. The idea is thus to focus designers' attention on that information needed to provide users with the necessary support for the actions that are to be performed through and by means of the IS.

The aim of this study is to critically examine the concept of actability and the 'actability dimensions' to uncover their relevance to the field of IS evaluation and design. This is done through an evaluation of a system developed using a traditional design method taking the actability dimensions as the criteria for evaluation, with the aim of identifying those areas that need improvement to strengthen the action support. Then a new system developed using the results of this endeavour along with the principles as guidance, aimed at producing a system that overcomes the problems of the original system, was evaluated with the purpose of assessing the use of actability principles to support the development of a more socially 'actable' IS. The evaluation and design activities reported on in this paper were undertaken by the first author. The primary driving force behind the study was a healthy scepticism regarding the merits of actability – a concept developed previously by the second author and colleagues. Hence, the evaluation of the usefulness of the principles and concepts under scrutiny was done by someone external to the development of these, with active support of one of their originators.

The paper is structured as follows. First the principles of actability and their associated dimensions are explained. Following this comes a brief description of the evaluation technique used to examine the information systems in question during this study. This leads into a description of the findings of the evaluations. A discussion of these then allows us to conclude that the actability dimensions are indeed valuable to evaluate and design information systems with the aim of creating more socially useful systems.

2 Actability Principles and Dimensions

From the work of Goldkuhl and Ågerfalk (2002) an IS's actability is defined as:

“[its] ability to perform actions, and to permit, promote and facilitate the performance of actions by users, both through the system and based on information from the system, in some business context”.

From this perspective of actability, today's information systems are used to perform social actions, including requests, promises, commitments, obligations (Ågerfalk et al. 2002), i.e. communicative actions (Habermas 1984) or speech acts (Searle 1969). These actions have consequences to the world of the actors who perform and interpret them by changing the world in which they preside. These changes can either be physical, e.g. the shipment of purchased goods, or social, such as the creation of a commitment. It is these social changes that are in focus when we speak of social and communication actions. These actions form a basis for important requirements on information systems.

According to actability, since information systems are being used to mediate between actors in the real world, they should integrate the actions that the users perform, to communicate amongst themselves, within their functionality. An IS can thus be understood as the set of all actions that it promotes, supports and affords – this is the action potential of the system (cf. Carroll 1996). A way to acknowledge the social action character of today's information systems would be to incorporate the notion of actability into the system's design. This has led to the development of a set of *actability dimensions* by Ågerfalk (2004) that can be used as guidelines to evaluate a system's action support and also to lead the effort to design actable information systems. They represent important elements and aspects to consider during the evaluations from an actability perspective; and guide design by generating the right questions to ask about the potential actions of the system.

To introduce an IS as a medium for communication changes the context away from the 'ideal' face-to-face conversation (cf. Clark 1996). The aim of the actability dimensions is to embrace these issues, bringing them to the forefront, to determine to what extent the IS facilitates the act of communication between its actors as communicators and interpreters while acknowledging differences compared to the face-to-face situation. The nine actability dimensions are presented in Table 1. Obviously, the actability dimensions share similarities with, yet differ from, other criteria for IS evaluation, such as Nielsen's (1994) ten usability heuristics and Shneiderman's (1998) eight golden rules. It is beyond the scope of this paper to go into detail of these differences and similarities, which have already been covered in some depth by Ågerfalk (2004).

Table 1: Nine Actability Dimensions (after Ågerfalk 2004).

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- 1. Action Elementariness:** The level at which the system represents, in a clear and understandable manner, the information about communicator, performer and intended interpreter of supported actions. It also needs to make visible and clear the content and intentions of the messages being sent and the actions being performed.
 - 2. Recorded Action:** How well the system records and displays information about performed actions, scheduled future actions and other action prerequisites. Does the system provide details to its users about what actions have previously been performed? Does the system record the action elementariness of all these actions?
 - 3. Action Potential:** The set of actions that the system promotes and affords. That is, the communication actions that are facilitated by using the system are only those that the system allows. Are they clear and understandable and is it possible to perform them all within the socially acceptable norms? This is important for maintaining accountability.
 - 4. Structured Action:** The system should regulate who can perform what actions, when and in what sequence. It should regulate the set of possible actions that can be performed as the interaction sequence progresses due to the action relationships created by communication actions.
 - 5. Irrevocable Action:** The system needs to make clear when there is an action that has no rollback or
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undo facilities related to it. The performer needs to know that a new social fact has been generated and it is not possible to backtrack from actions performed. Therefore the system needs to make it explicit each time a business action is being performed.

6. Remote Activity: There needs to be flexible access to the system's action potential at all times that it is necessary. If performers do not share the same physical environment, can they still avail of the services of the business actions of the system?

7. Delayed Interpretation: Participants may not perceive each other's actions at the same time. Often there will be a delay in the interpretation of communicated actions. The system needs to relay this information to its actors and also keep track of timestamps and receipt of messages by their intended interpreters.

8. Delayed Feedback: No feedback on communication effects is available until a message has been received and interpreted by its intended recipient. This information needs to be relayed to the message's communicator and this delay needs to be kept to a minimum by the system.

9. Delegated Action: Actors and the system itself, may take action on behalf of others and of their organisation. Do the people involved understand their responsibilities and the action relationships created on their behalf? Does the system support this?

3 Research Approach

The research approach adopted in this work took the form of a case-based study of two information systems. For the purpose of this study, the actability dimensions were first used to explore and evaluate the OpenConf paper submission system, assumed to be the product of a traditional design strategy. They were then used in a similar fashion to evaluate a new system (referred to as SSASS), which had the actability dimensions availing during its design and implementation (representing a complete redesign of OpenConf). A brief description of these two systems can be found in Table 2.

Table 2: Brief descriptions of the systems in this study.

<p>OpenConf is a conference management system that is freely available for download from the Zakon Group (2005). It is written in PHP and uses the Apache server and MySQL database systems. It is a web-based system that is used to assist the electronic submission, review and advocacy of research papers for the conference being organised by its users. Those that are involved with the system are the paper authors, a review board, a program committee and a program chair (PC). The PC manages the whole process. The PC must initially invite potential reviewers and program committee members to the system, who then sign up and register themselves with the OpenConf system. The system is then open for anyone to submit a paper to be considered for review for the conference in question. The paper's author must enter the necessary details, attach a blind copy of the paper and also select a number of appropriate conference topics from a list indicated by the PC. The PC then assesses the papers relevance and assigns a number of reviewers, from the review board, to review the paper, and also a paper advocate, from the program committee. Each reviewer then reviews the papers according to the guidelines provided. The advocate makes a recommendation about the paper to the PC, whether to accept or reject it for the conference. The PC then makes a final decision taking into consideration all the reviews and the suggestion of the advocate. If the PC accepts the paper, the author submits a final version of the paper. Once this has been done the process is complete.</p>
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<p>SSASS is a web-based system being developed for the on-line journal SySiAc (2006). It will be used for the submission and review of papers for publication. It is a redesign of OpenConf, reusing those features that are common to both business contexts. The system is developed using PHP, Apache and MySQL. The users involved are paper authors, a review board, and the editorial team (a number of associate editors and editor-in-chiefs). There is also an administrator that maintains the system. The administrator registers all new members and handles the configuration details of the system. The system is then open to any author to submit a paper for consideration for publication. It must first go through a thorough peer-review process that is supported by the system. The system requests an AE</p>
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for the paper, who then assesses its relevance and assigns an EiC to manage the review and editorial process. The EiC requests a number of reviewers for the paper from the editorial board. They agree amongst themselves a date by which time the reviews must be completed and submitted. Once the reviews have been finalised the EiC makes a decision whether to accept, reject or suggest development of the paper to its author. If the paper is accepted, the author submits a final version, which will be published in the journal. If development is proposed, an editorial process is commenced for the paper where its author must resubmit a new version, making the necessary changes to it as suggested by the EiC. The review process is then repeated until the paper is either accepted or rejected by the EiC. Once this decision has been made the submission process is complete.

To perform a useful evaluation of these systems it was necessary to investigate the relationship between their actions and those of the potential users. In order to give an accurate measure of their quality in use, it was important to represent the communicative aspects in the evaluation. The systems should enhance the communicative requirements of their users, and it should be feasible to show a measure of how well they perform this role. To evaluate and understand the usability and effectiveness of these systems, it was thus important to include their action component in the scope of the evaluation (Walsham 1993).

To assess the social action (i.e. the user-to-user communication through user-system interaction) potential of an IS, we need some guidance. The actability dimensions contain properties of an IS and its user interface that need attention during the evaluation. They can be seen as heuristics to be used to evaluate a system's actability. These heuristics are supposed to guide the evaluator in finding the problems and highlighting the strengths of the systems being examined. The evaluation consisted of two stages: an ideal typical analysis phase and a situational analysis phase (Ågerfalk et al. 2002). The first phase took the form of a criteria-based heuristic evaluation, where the systems were evaluated against a set of actability heuristics derived from the actability dimensions. The results of this phase can be regarded as a theoretically justified description of the systems' action performance as seen by the evaluator. To complement the 'expert evaluation', the second phase focused on the systems as experienced by their users. By obtaining the users' perception of the systems' level of action support it was possible to add to and rationalise the findings of the initial evaluation with those of the users' experiences. In this second phase of the evaluations, data was collected by means of a questionnaire that operationalised the actability dimensions and targeted a limited sample of key informants with recent experience of the respective system. The aim was not to achieve statistical generalisability but to get in-depth qualitative feedback based on open-ended questions.

Before performing a heuristic evaluation, it is necessary to obtain a sound understanding of the system itself and the business context that it represents. The goal is to identify if and how the IS supports the actions that are performed in the business. This involved reconstructing all the necessary actions performed by the business being studied, and also those that the system facilitates (Ågerfalk et al. 2002). Also the system's database design was reconstructed to discover what data was being stored and manipulated by the system. This information facilitated the construction of a detailed description of the operations of the system. From here the actability dimensions provided questions and issues that guided the evaluator to determine the system's ability to perform the social actions of the business context in which it is situated, thus revealing the existing action potential provided by the system in its current state. This action potential was then examined with respect to the actability heuristics and the business goals (Ågerfalk et al. 2002). Each criterion was addressed based on the available

sources of information, such as the system itself, documentation, source code, and database. The criteria used for this study can be seen in Appendix A.

4 Results

The OpenConf evaluation examined a system that was designed with no reference to the actability dimensions, so it was expected that this study would reveal where the system failed to support the action needs of its users. On the other hand, the SSASS evaluation examined a system that had taken these dimensions into consideration, so it was expected that this study would show their possibly practical benefits by applying them to an actual system. Below, the results of the evaluation of the OpenConf system are followed by those of the SSASS system leading into a discussion of the possible relevance and benefits to evaluation and design of information systems.

4.1 OpenConf

This system supposedly followed a traditional data-driven approach to system design. The results of this evaluation give us a view of the system's actability and an understanding of its lacking ability to 'permit, promote and facilitate' the communication actions of its actors. The system supported the submission, review and decision process of papers for conferences through the use of a web application. However, from an actability perspective, it is important not to view this process only as the registering in the system the fact that committee members have been assigned for particular roles in the review process and the performance of these roles, storing the results in the system's database, but also to support the actual assignment. The OpenConf system failed to provide this level of support to its users. It did not facilitate the performance of many of the social and communication actions through it by its actors; instead they were forced to be carried out through a different medium. In addition to revealing this weakness, the evaluation enabled the assessment of the system's ability to support those actions that it did in fact permit through it. A summary of the observed actions can be seen in Table 3, those taken through the system and also those forced outside of it.

Since the system permits the submission of papers for consideration of appearance at a conference, at first glance it appears to provide adequate support for the dimensions of *Recorded Action* and *Action Potential* due to the fact that when an author submits a paper and uploads it to the system it keeps track of who has submitted what, and when this occurred. However, the author can edit the submission details and re-upload the paper at any time. The system does not keep track of these changes to the details and only saves the latest version of the paper and makes no record of the fact that there is a new version in the system. Therefore it does not provide a history of the changes and the reasons for them. This indicates that the system lacks support for *Structured* and *Recorded Action* here.

Table 3: Actions Observed from the process managed by OpenConf.

Communicator	Identified Actions	Interpreter(s)
Committee Member	Committee Member Sign-up	PC
Author	Paper Submission	PC
PC	PC Management of Papers	PC
PC	PC Management of Configuration Details	PC
PC	Assignment of Reviewer Committee Members	Review Committee Member
PC	Assignment of Program Committee Members	Program Committee Member

Review Committee Member	Decision on Assignment	PC
Program Committee Member	Decision on Assignment	PC
Reviewer	Submission of Review	PC
Advocate	Submission of Recommendation	PC
PC	PC Final Decision	Author
Author	Final Paper Upload	Committee Members
PC	Close Case	Author & Committee Members

The system also lacks the provision of relevant information and guidance to its users. It is often unclear what is required of them, what additional tasks they need to perform; when a decision is made that has consequences on them, etc. Because of this, the system falls short in supporting the *Action Elementariness* of the users' requirements. To strengthen this it should provide ample information indicating what procedures have, are and will be taking place during their interaction with it. It should present enough information about communicator, descriptive function, action mode and intended interpreter so as to allow for the determination of what actions are being performed by whom and for what reason. At times the system does provide its users with information to facilitate their desired actions, e.g. during assignment of reviewers it gives details as to the amount of reviewers already assigned, the number of papers already assigned to each reviewer, etc. However, at times this information is unclear and the user has to interpret its meaning. Because of this, it fails to explain the referring function (meaning) of this information, again resulting in poor support of the *Action Elementariness* of these messages.

Following the completion of many of the actions of the system's users it presents them with messages that are very vague and unclear. Hence the system again provides little or no information about the performed action, the communicator of the message or intended further actions. According to the actability theory, this would potentially make it difficult for the actors to interpret the meaning of these messages to determine the validity of actions performed, their repercussions, or to formulate their actions in response to them. The system does not send any notification to the users as to actions taken, or decisions made, or indicate timelines as to when these actions and decisions will be taken. This shows that the *Delayed Feedback* and *Delayed Interpretation* dimensions of its actability are lacking. The evaluation also indicates that the system does not keep a record of the dates of the operations performed by its users so that they can successfully check as to who performed what, when and why. Here again the system falls short in its support for the *Recorded Action* dimension of the business it accommodates.

The system also allows its users to take actions that affect previously made commitments, e.g. it permits the un-assigning and re-assigning of committee members to papers even when these committee members have been notified of commitments made between them and the conference. These actions are not communicated to those affected members. The system should prevent all actors from performing actions that may have consequences on others if not acceptable through the social norms of the business context. The system does not provide relevant information as to the effect these actions have on others. Therefore it lacks support for *Structured Action* because it should prohibit the actors from changing the commitments made during the review process. In addition the system keeps no record of any assignments or un-assignments made, losing its *Recorded Action* possibilities again.

Overshadowing all of these reported problems lays one major flaw in the system (which, in our experience, is reflected in many traditional information systems). Throughout the business

context being supported there is a lack of structured support for the communication between the different actors of the system as they perform actions that affect others. For example, when the program chair chooses a committee member as a reviewer of a paper, the system automatically assigns these actors as reviewers within its database. Therefore the assignment is handled as a *declaration* rather than as a *request*, while, in fact, the system creates a social fact rather than reporting it. It is not possible for the committee members to decline to be paper reviewers through the system. There is no provision for negotiation, and all communications between the actors must take place outside of the system. This highlights the systems poor level of *Action Potentiality* when it comes to supporting this negotiation process. The system could accommodate this process through it rather than forcing it to occur outside of it. If this facility was provided then the system could keep a record of all requests made, reasons given for their acceptance or decline and all social actions communicated between them. This would then provide the *Recorded Action* dimension that was reported as missed from before. Overcoming this deficit was the main goal of the design and development of the SSASS system.

4.2 The SSASS System

The SSASS system was designed following the principles of actability. The results of the evaluation can be used to assess to what extent the actability dimensions are useful to successfully guide the creation of a more actable IS. A summary of the observed actions from the process managed by the SSASS system is presented in Table 4.

All relevant actions are permitted through the system, as opposed to outside. The system not only sustains the submission and review process, but also provides support for the communication action requirements of its users. It provides a means for all negotiations, requests, responses, decision-making, etc. This shows that the system supports the actability dimension of *Action Potentiality*. It keeps a trace of all requests, responses, decisions, etc in its database. This means it can log all of the performed actions and provide this information to its users in a desirable fashion.

Table 4: Action Requirements of SSAS.

Communicator	Actions	Interpreter(s)
Administrator	Editorial Team Sign-up	Potential Team Member
Paper Author	Paper Submission	Associate Editor
Editorial Team	Request of Associate Editor for Paper	Associate Editor
Associate Editor	Response to Request for Associate Editor	Editorial Team
Associate Editor	Decision on Relevance of Paper	Editor-in-Chief
Editor-in-Chief	Initial Decision on Paper	Paper Author
Associate Editor	Request of Editor-in-Chief for Paper	Editor-in-Chief
Editor-in-Chief	Response to Request for Editor-in-Chief	Associate Editor
Editor-in-Chief	Request of Reviewer for Paper	Editorial Board Member
Associate Editor	Response to Request for Reviewer	Editor-in-Chief & Editorial Board Member
Associate Editor	Decision on Accepted Reviewer	Editorial Board Member & Editor-in-Chief
Editorial Team	Assignment of Paper Reviewer	Editorial Board Member
Editorial Board Member	Submission of Review	Editor-in-Chief
Editor-in-Chief	Publication Decision	Paper Author & Editorial Team
Paper Author	Decision on Suggested Development	Editor-in-Chief
Paper Author	New Version Upload	Editorial Team
Paper Author	Final Paper Upload	Editorial Team
Editor-in-Chief	Close Case	Paper Author & Editorial Team

The system explains the consequences of all performed actions in a meaningful fashion at all times. It indicates what commitments they are entering into when performing their actions, which strengthens the *Action Potentiality* aspect of the system. For example, it indicates what commitments the authors are agreeing to when submitting papers to the system. Once the paper has been submitted, the system creates an account where its author can sign in and check the history and progress of the review process. This improves the *Delayed Feedback* characteristic of the system. They can immediately find out what actions have already been performed in response to their performed actions and also determine what tasks are required of them to assist with the process.

The actions that need to be performed by each actor in response to and as a result of previously performed actions are laid out in a clear and understandable manner. A table shows the actions that have been taken and those that need further attention, and it allows them to follow up on previously made commitments. This supports the actability dimension of *Structured Action*. All of the actions of interest are ordered, as they will occur, enabling them to determine what stage the process is at. By grouping the important information about each action together in a meaningful way the system strengthens its *Action Elementariness*. The referring function and action mode of each message is grouped together separately in a

consistent and understandable fashion. The system also presents the users with details of the action potential of all allowable actions. The users can now confidently and successfully formulate the responses to those requests made of them. This also improves the *Action Potentiality* of the system's support of its users' needs.

The system utilises its *Recorded Action* strength by making available to its users the history of all relevant actors and the commitments made by each as currently stored in the system. This again improves the *Action Potentiality* because it means there is enough information presented in the appropriate request forms to allow for the accurate formulation of the request without having the need to look for any more from other sources. It allows its actors to request the services of others rather than handling the communication actions as declarations and storing assignments automatically in its database, as was the case with the OpenConf system. This will then allow for a negotiation process to begin between both parties.

The system has been designed to handle the notification of all performed actions to those actors they have consequences on. It informs all actors of pending actions that need their consideration. Removing this responsibility from the performers of these actions will improve the *Delayed Interpretation* actability dimension of its users' action requirements. Once an action is performed and it needs communicating to its intended interpreter, the system creates an email and immediately sends it to those actors that the action affects. In this way the time taken from communication to interpretation will be kept to a minimum because the communicator no longer has to remember to notify his/her intended interpreter.

One of the problems observed of the OpenConf system was that it allowed the paper reviewers to change their reviews even after they have submitted them as completed to the review board. Once the SSASS reviewers indicate their completion they can no longer make changes to the details. They can access its contents in a read-only fashion, sustaining the *Recorded Action* dimension, but cannot alter it. This prevents them from backing out of their already made commitments. It is necessary to put this restriction on available actions so that all involved can have confidence in the validity of that information submitted by others. This restriction is enforced on the actions available to other actors also to strengthen the overall integrity of the system's communication action support. Each actor is given the opportunity to respond to a request, and it is only when they agree to that which is asked of them an agreement will be made that commits them to take responsibility for the task at hand. Once they have performed the desired action the system prohibits them from changing the results. This again strengthens the *Structured Action*, *Irrevocable Action*, *Recorded Action* and *Action Potentiality* actability dimensions of the system.

The evaluation has shown that the system "permits, promotes and facilitates" the actability needs of its users throughout. It also does this in a consistent and understandable fashion. It has been shown that the system provides all that is needed by its users to formulate their desired actions rather than forcing them to look elsewhere for other sources of information. The users' ability to navigate around the system to find this information to determine which actions have been performed, which need interpreting and which need further attention has been greatly improved. All of this together creates a more understandable, desirable and holistic user experience.

5 Discussion

This research has shown that traditional information systems tend to represent a 'descriptive perspective' of the business context neglecting the social action aspects of their users' needs.

Using the concept of actability and its associated dimensions it is possible to overcome this deficiency by producing systems that support the social and communication action potential of the business context it represents. The aim of the OpenConf evaluation was to highlight those areas that either strengthened or weakened the system's actability as seen from the criteria provided. The goal of the SSASS evaluation was to evaluate the success of the design and development efforts at generating a system that satisfies the social action requirements of its stakeholders. This enabled the creation of a description of the systems' level of action support.

An in-depth analysis of the results of the OpenConf system's evaluation showed that it was weak in many areas of its support. The social action context of the business was neglected by the system. Upon reflection, the users had indicated certain issues that resulted in poor support for their needs and some of the respondents specifically pointed out areas that reflected these weaknesses. This highlighted that the users of those systems that are the product of traditional design methods may not realise their weaknesses in supporting their actual action needs until they are asked to focus on the system's actability. They often do not realise that they can be used to offer much more support for their action needs than is being currently provided. All of this suggests that many users' of traditional systems do not recognize the potential of an IS to support their action requirements, and because of this the possibility of harnessing this power is being lost.

For an IS to be actable it is necessary for it to support all the action needs of its users. They should be supported through the system rather than outside of it. The evaluation of the OpenConf system revealed that did not facilitate any form of negotiation, communication, agreement making, etc. through it, while the SSASS system, on the other hand, facilitates all these actions in an acceptably sequential manner showing a higher degree of support. In the OpenConf system, when a reviewer is selected the system automatically assigned this actor to the paper. This assignment was handled as a declaration rather than as a request. The system recorded the fact that the reviewer was assigned to the paper – declaring it as a social fact. This assignment in itself is a social action supported by the system, but the reviewer does not have the ability to decline the responsibility of reviewing the particular paper. This negotiation phase has to take place outside of the system. The system does not keep any record of this or other negotiation phases. From an actability perspective this shows the system's weak support of the core actions of its actors.

However, performance through an IS adds additional constraints and overheads to the communication and social actions directed from one actor to another. The actability dimensions allow the determination of the validity of the order these actions are permitted to be performed, the choices provided to the users, restrictions imposed on their actions, etc. Actability dictates that all of the desired action needs of the users be available through the system in a structured way. Then they demand that information about the communicator, intended interpreter, date stamps, etc of each action be recorded. The users of the SSASS system stressed their desire to have a system that facilitates various forms of requests, negotiations, decision making, commitments, etc. through the system, eliminating the need to take these actions through another medium outside of this system. The system stores relevant information about each action's date, resultant decision, reason, etc which is useful to its associated actors when needed to either understand previously performed actions or to formulate additional actions during their usage of the system. In this way, the users can be confident that the consequences of their actions on others are limited to that which is expected from the submission and review process.

The SSASS system provides messages to its users for a number of reasons: to clarify the restrictions that are being imposed on their actions due to the business norms being supported, to present information about previously performed actions to help formulate responses, to explain the reasons for the request of certain information from the user, to explain the consequences of those actions that are to be performed, etc. All of this improves the system's actability. Following the principles of actability the user needs information about: those actions that they need to perform, performer, communicator and meaning of messages directed towards them, etc. However, the information that the OpenConf system provides to its users lacks understandable meaning (from an actability perspective), resulting in the possible misinterpretation of their actions. It provides poor information about the actions performed, or those intended further actions of the actors. In addition to this, the system does not inform its users of the consequences of their actions in a manner acceptable within the boundaries set by the actability dimensions. Also it does not enforce restrictions on the action sequences of its users. This could result in major problems and complications during system usage.

The results of this study highlight the SSASS system's ability to suitably support the social and communication action needs of its users. It does this in a successful way because of the use of the actability dimensions to guide the design and development efforts. As can be seen, using the dimensions results in a different approach to system design and also the production of a new form of information systems. It creates those systems that provide a fuller and more complete support of the social and communication actions that are required to perform the business needs of its users through the system rather than the previous method of just handling the manipulation of the users' data and forcing the additional action performance to be taken through another medium outside of the scope of the developed system. Thus there is indeed added value in the use of actability to design information systems.

6 Conclusions

To show how traditional methods of system design can fail to produce information systems that successfully support the social and communication action needs of their users, the evaluation of the OpenConf system revealed that it severely neglected the social action requirements of its users. Although the users seemed to be successfully and satisfactorily using the system to accommodate their needs of submitting and reviewing papers for conferences, an in-depth analysis revealed that they had experienced several problems – those related to the poor action support provided by the system. This demonstrates that for the traditional systems available today, their users do not perceive problems with the limited action support that they are provided with. It is crucial that this aspect is communicated to the users and designers of these systems to enable them to clearly see the power that can be harvested through a better understanding of the notion of user action support. The use of the actability dimensions for system evaluation proved to be a powerful tool for uncovering these problems and creating this necessary awareness.

The results of the SSASS evaluation revealed its ability to overcome the identified problems of the OpenConf system by using the principles of actability during its design. SSASS facilitates the social and communication action needs of its users through the system because its conceptual and database models were designed to incorporate them. It caters for a database which supports the action needs of its users, used to store a recorded history of the important actions performed through and by means of the system. These actions are facilitated by the system allowing them to be taken through it in a meaningful fashion as opposed to the

traditional method, which may force them to be taken outside of the system – and hence compromise the traceability and accountability of actions performed. Also by using the actability dimensions to guide the presentation of information pertaining to both the previous actions performed and those required by its users, the system can provide the necessary information that afford them to formulate their actions in an accurate way, thus reducing the risk of user misunderstanding and misinterpretation that can lead to errors (both in terms of inconsistent data in the system and in terms of poorly functioning business processes, broken promises, etc).

Upon reflection, the new SSASS system is very different to that of the original OpenConf system. The fact that they differ so much indicates that this is a radically different approach to IS design and development. The foremost power of actability seen in this study is its ability to focus the designers' attention on the action needs of the system's users. It may well be possible to arrive at a system similar to the one produced using these principles, without using them explicitly, but this would then depend on the experience and competence of the designers. Instead, actability can indeed provide a means to guarantee the success of the design and development effort to produce a system that supports the social and communication action needs of its users in a useful way.

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Appendix A

From the nine actability dimensions the following criteria and questions were derived:

- 1. The system should handle all messages that are resultant from all the communication actions performed by its users.**
 - Is information about the referring and predicating functions of all messages visible?
 - Is information about the action mode of all messages visible?
 - Is information about the communicator and intended interpreter visible?
 - Are these messages kept separate from each other in a consistent and understandable fashion?
- 2. The user's actions should leave a record in the system's memory.**
 - Does the system store relevant information about previously performed actions?
 - Is information about performer, communicator and interpreter stored?
 - Is this information accessible to those users that may require it?
- 3. The system should be made up of the action potential of its hosting business context – it should allow for the performance of all required actions of its users in an easy, understandable and legal manner.**
 - Does the system offer all the actions that are required by the users?
 - Are the effects of these actions presented to the users?
 - Does the system provide enough information about all actions so that its users can use it quickly and easily to perform their desired actions?
 - Is information about the legality or sincerity of all communicated actions provided to the user to allow them to determine the validity of actions performed by themselves or others?
 - Is this information presented in a consistent and understandable way using components that are familiar to the users (icons, labels, etc.)?
 - When the system requires information from its users does it ask for it in a meaningful way making it easy for the user to provide it?
 - Does the language used in the system correspond to the language of the business context that is using it?
 - Does the system provide relevant information to justify and explain those actions that it requires of its users?
- 4. The business rules and norms should determine what actions can be taken and when.**
 - Does the system assist its performers to know what they are doing?
 - Are the choices of different actions available to the users displayed in an understandable manner?
 - Does the system support users to know what actions they need to perform – does it help with issues of how, when and where to do so?
 - Does the system help users to follow up on previously made commitments?
 - Does the system enforce sequence restrictions when necessary to stop users from performing actions when they should not?
 - Is the navigation style consistent and easy to work with?
- 5. Actions may be performed reflectively over an extended period of time, as opposed to the face-to-face situation when they are instant.**
 - Is the system explicit about when a communication action is about to be performed?

- Does the system provide an undo facility (roll-back) when acceptable by the social norms?
 - Does the system clearly indicate when an irrevocable action is about to be performed?
6. **The users will generally not share the same physical environment so the system should support this.**
- Is the action potential of the system available to its users whenever and wherever necessary?
 - Is it possible to formulate and send messages at all desired locations in all desired ways?
 - Is it possible to receive and interpret all messages at all desired locations in all desired ways?
7. **The users may perceive each other's actions with some delay so the system needs to handle this.**
- Do the messages reach their intended interpreters on time?
 - Does the system indicate to its performers when there will be a delay in the receipt of a message by its intended interpreter?
 - Does the system keep track of timestamps of when actions are performed?
8. **The users will only produce or receive messages at any given time, but not simultaneously. The system needs to support this.**
- Does the system make clear to its performers that no feedback will be available on communication actions until the message has been received, interpreted and acted upon by its intended interpreter?
 - If there is going to be a delay in the feedback does the system relay this information back to the performer of the communication?
 - Does the system strive to keep this delay to a minimum?
9. **The system should permit performers to take actions on behalf of others and of their organisation itself, and handle this in a clear and understandable fashion.**
- Is the responsibility of carrying out actions allocated to actors or the system itself to maximise the support given to users to perform social actions through the system?
 - When the system performs automatic actions does it indicate this to its users?
 - Does the system provide descriptions of its performed and scheduled future actions to its users?
 - Are all users aware of all communicated actions that they are responsible for, those that they perform themselves and those that are performed on their behalf?