

# **Applying Action Research to Designing, Introducing and Evaluating Information Systems in Small and Medium sized Enterprises (SMEs): Prospects and Critical Success Factors**

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## **Abstract**

The introduction of IS in SMEs requires numerous decisions. To derive a decision it is necessary to collect and evaluate alternative options. Since IS can hardly be regarded as an end in itself, it is necessary to also focus on the people affected by the system and the potential organisational change and to perceive the various options and how they influence the organisation. The selection and design of IS that are integrated with a company's business processes require the timely evaluation of organisational and technological options. This paper presents an action research framework for IS projects adapted for the special needs of SMEs.

## **1. Motivation**

The design of information systems to increase the productivity of business processes usually requires to analyse and eventually to redesign existing processes and established ways to perform tasks. Hence, requirements analysis is not just a matter of questioning users about the demanded functionality of the system to be designed. Instead there is need to develop an elaborate image of the future organisation together with that of a supporting information system (IS). The evaluation of the status quo as well as of design options requires to take into account various aspects, such as the long term corporate strategy, skills and flexibility of the work force, cost of acquisition and maintenance, quality of the underlying software technology etc. The evaluation of these aspects involves various stakeholders, such as managers, users, and information technology professionals. Many stakeholders do not know about (and often do not want to be bothered with) technological criteria – although they may have a substantial effect on a system's usability and economics in the long run. Often, decision makers are not interested in details. They are, however, in need of convincing arguments to legitimate their decisions. From a scientific point of view, a solution developed for a particular firm is not satisfactory. Instead, scientific research demands abstraction and innovation. Abstraction means that findings concerning the efficiency of particular system features should be generalized so that they can be applied to a whole range of companies. Innovation is aimed at the development of concepts and corresponding artefacts that feature original ideas. At first sight, it may seem that empirical research offers adequate means to evaluate innovative concepts and their applicability to a range of companies. However, empirical research

faces severe obstacles, focusing on an ex post evaluation of a set of design alternatives, i.e. after they have been implemented in an organization. In most cases it will not be feasible to implement an option for the purpose of its evaluation only. In addition to that, such an approach would be questionable, too. As soon as a system has been implemented, it changes its environment. In order to evaluate a system, users have to learn how to interact with it, which in turn will very likely bias their perception.

Against the background of these difficulties, one may decide that the design of information systems is not an adequate subject of IS research. However, in our opinion, leaving the design of concepts to construct information systems to software firms is not satisfactory. This is for two reasons. Firstly, information systems are of essential importance for the competitiveness of businesses. Therefore they deserve scientific attention. Secondly, designing concepts and systems is a challenging intellectual task that may well include essential aspects of scientific research, such as abstraction, originality and reason. While empirical research on an ex post base is no feasible option, there is still need for a research method that allows for confronting concepts and artefacts with reality. While it has never been popular in German IS, action research nevertheless seems to be well suited to guide projects that are aimed at the development of innovative artefacts: it does not only emphasize the cooperation between scientists and practitioners, it also aims at the implementation of acceptable solutions. In the following section we will outline how to adapt action research to the needs of system analysis and design. Based on that and the analysis of an action research project we are currently conducting with SMEs, we will then introduce a refined action research framework that is adapted to specific conditions to be taken into account with the introduction of information systems in SMEs.

## **2. Action Research in IS Projects**

Similar to Information Systems research in many countries, research in “Wirtschaftsinformatik” in Germany covers a wide range of subjects. Different from research in the USA, empirical research is only of little relevance. Hermeneutic research approaches as they are common in the UK and Scandinavia can hardly be found either. Instead, there is emphasis on the design of IS artefacts, such as conceptual models, modelling languages or – usually prototypical – application systems. Frequently, applied research is conducted in close cooperation with commercial enterprises. It is typically aimed at developing concepts and eventually designing applications to increase the efficiency of business processes. Since it stresses practical relevance and generates external funding, research of this kind is well suited to contribute to a university’s reputation. Nevertheless, there has been a sustainable discussion during the last years concerning serious methodological questions (for an overview, see Frank 1998). On the one hand, they are related to the profile of scientific research compared to consultancy firms. On the other hand, they deal with the evaluation of research results and – as a consequence – with the identification of scientific progress. However, in applied IS research, evaluation is not only a matter of gaining new scientific insights. From the viewpoint of the involved business firms, the economics of the developed concepts and artefacts will usually be of outstanding relevance. Both, the evaluation of a system’s economics and the evaluation of concepts or artefacts with respect to scientific progress face a number of challenges.

### **2.1. The need for additional abstractions/models in Information System Development**

Designing software requires developing descriptions of the relevant domain on an appropriate level of abstraction. Usually it will be necessary to involve domain experts without a specific background in software engineering. Therefore, implementation level languages such as programming languages are not suited for describing systems during analysis and design. However, natural language is not adequate either, because natural language descriptions lack the precision and structure that is eventually required for implementation. As a consequence of this

conflict, conceptual models have been suggested to allow for "... descriptions of a world enterprise/slice of reality which correspond directly and naturally to our own conceptualisations of the object of these descriptions." (Mylopoulos 1985). While it is hard to say what makes a "natural" description, conceptual models foster an intuitive understanding by focusing on domain level concepts, by omitting implementation specific details and by featuring a graphical notation. At the same time concepts of languages for conceptual modelling correspond to concepts in implementation level languages. A widely used language for conceptual modelling is the Entity Relationship Model (ERM). According to our experience, however, data models alone are not sufficient to document a system in a way that would foster discussions with domain experts and prospective users. Instead we suggest to cover various perspectives on an enterprise by a set of integrated models. For this purpose, we have developed a method for "Multi Perspective Enterprise Modelling" (MEMO) during the last years (Frank 1999). On a top level, MEMO offers a generic conceptual framework that corresponds to common abstractions of business firms. It differentiates three so-called perspectives - strategy, organisation and information system - each of which is structured by five aspects: structure, process, resources, goals and environment. A participant in a discussion can literally point to the focus of his concern by selecting a particular aspect within a perspective. In fig. 1 the meaning of the various foci is illustrated by exemplary terms.

|              |                       | ASPECTS                             |                                 |                                 |                                    |                                                |
|--------------|-----------------------|-------------------------------------|---------------------------------|---------------------------------|------------------------------------|------------------------------------------------|
|              |                       | Resource                            | Structure                       | Process                         | Goal                               | Environment                                    |
| PERSPECTIVES | Strategy              | Human<br>Resource<br>Capital Assets | Strategic<br>Business Unit      | Generic Strategy<br>Value Chain | Competitive<br>Advantage<br>Margin | Competitor<br>Customer<br>Supplier<br>Politics |
|              | Organisa-<br>tion     | Employee<br>Equipment<br>Machinery  | Organisation<br>Structure       | Business<br>Process<br>Task     | Operational<br>Goal                | Customer<br>Supplier                           |
|              | Information<br>System | Platform<br>Application<br>Tool     | IS Architecture<br>Object Model | Transaction<br>Workflow         | Requirement<br>Metrics             | Interfaces<br>Standards                        |

*Fig. 1: The MEMO framework*

To allow for more detailed descriptions from various perspectives, MEMO provides a set of modelling languages. MEMO Organisation Modelling Language (MEMO OrgML) serves to model business processes and organization structure. MEMO Strategy Modelling Language (MEMO SML) supports the description and visualization of a company's strategy. Finally, MEMO Object Modelling Language (MEMO OML) allows for an object-oriented description of information that is used and/or produced by an information system. In order to foster the integrity of a set of models, the MEMO modelling languages allow for a tight integration of models. fig. 2 illustrates the types of models and their integration.

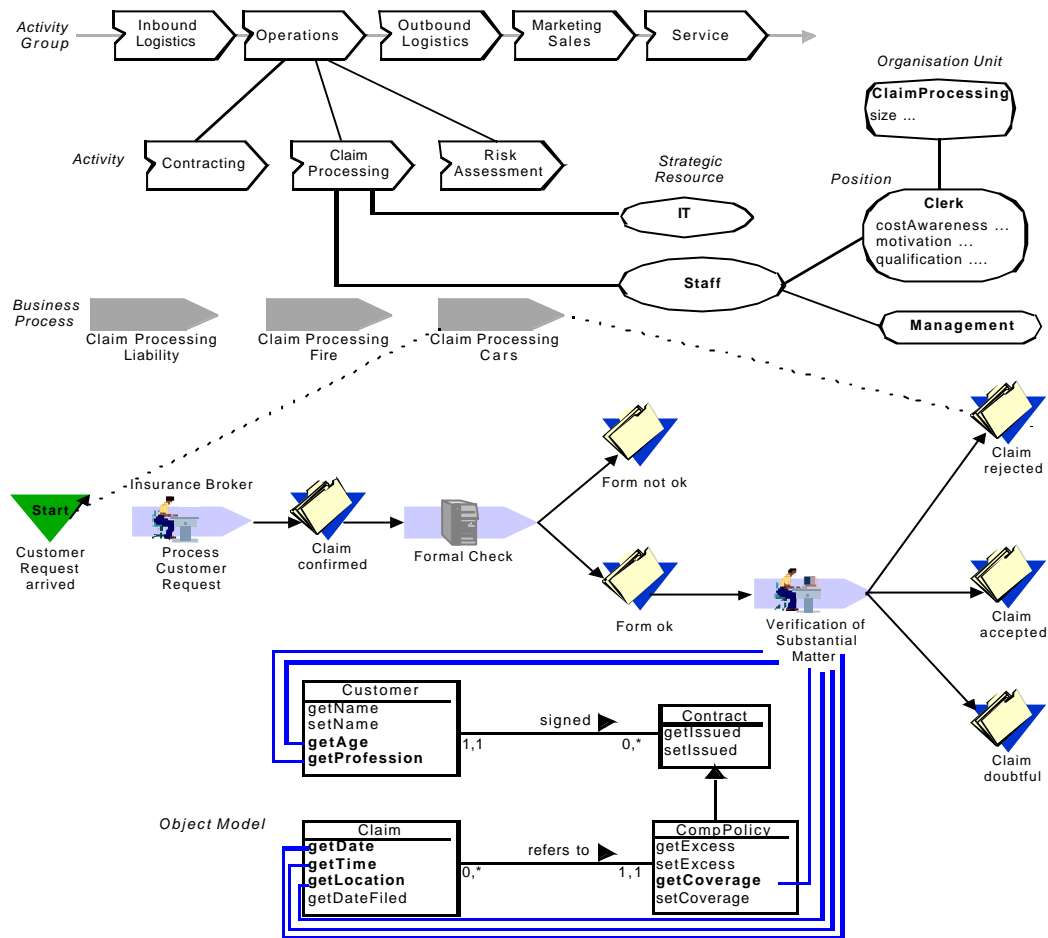


Fig. 2: Excerpts of exemplary MEMO models and illustration of their integration

## 2.2. The need for a process Model in IS Action Research Projects

Considering the fact that the IS discipline is commonly regarded as an applied science that aims at knowledge for successful action, it is not surprising that Baskerville and Wood-Harper state: "The discipline of IS seems to be a very appropriate field for the use of actions research methods." (Baskerville 1998) However, the action research framework proposed by Lewin is intended to guide research in the social sciences in general. The framework remains on a rather abstract level. This allows for its use in a wide range of projects. At the same time, it lacks detailed support for specific types of projects.

While this may be acceptable for many projects that are aiming at processes of social change, it is not sufficient for system analysis and design. This is for various reasons. While an information system should represent a real world domain, it has to be specified in a formal or semi-formal language in the end in order to prepare for its implementation. Hence, system analysts and designers need appropriate languages to describe and mediate system features. In addition to that, the complexity of information systems recommends a systematic approach that divides the overall project into a set of smaller tasks.

In a number of projects we encountered that the use of conceptual models adds structure to a software development project and inspires discussions with domain experts and users. The latter is especially the case with models of business processes. However, modelling languages alone offer only limited support for the design of information systems. A process model provides additional guidance by decomposing the overall project into manageable activities, which are linked via

causal or temporal relationships. To support the organisation of a project, each activity is assigned roles and documents it requires or produces.

### **3. Introduction to ProHIT**

Most trade businesses in Germany are SMEs with a majority being small. In addition we found that many SMEs do not apply concepts and practices commonly used in industry. With an aim to benefit the trade sector, we took a look at the issues of logistics and project management in trade. Against this background two research projects FlottHIT and ProHIT were initiated in cooperation with the chamber of trade, and financial backing by the Ministry for Commerce of the state of Rheinland-Pfalz and the Foundation for Innovation respectively.

The organisation of trade in Germany is unique, although some eastern European countries are creating similar structures. The term “trade business” is not clearly defined, but the code of the trade organisation, the “Handwerksordnung” (HWO) defines trade businesses as those registered in the “Handwerksrolle” – a mandatory register, which is governed by an institution to whom all trade businesses have to be members, the chamber of trade. In order to be enrolled it is necessary to be a master of trade. The process of becoming a master of a trade involves a number of training stages, which are very similar to the processes involved in the original mediaeval trade guilds. Starting as an apprentice for three years, one becomes a journeyman after successfully passing the “Gesellenprüfung” exam. Journeymen seldom go on the traditional journey but continue training and, after having completed the set stages, can attempt the Master exam “Meisterprüfung” (Pieroth 1997).

The project “Computer Assisted Project Management in Trade” (ProHIT) is concerned with the introduction of project management to SMEs. Project management has long evolved from its original, more limited understanding in the private sector, and is now even becoming popular in social problem areas or emergency aid. Project management is now seen, as a standard way of doing things rather than special needs management (Pinto 1995).

As the need for businesses of all sizes to engage in cooperative, inter-organisational activity increases, SMEs are particularly at risk of being forced to adapt to systems, which they do not understand, and in which they have no experience. Most of these businesses undertake successful projects and as we have found have an intuitive way to do so. Amongst the many reasons for involvement in project management are some, which particularly apply to SMEs. Some of these are, for example, bespoke production, increasing competition and customer focus which companies of all sizes face. It became apparent that a large number of smaller businesses whose work is typically project oriented are again part of the trade sector (Handwerkskammer 2000). Part of the aim of this research project is the introduction of an information system to integrate a project management system in a SME environment. In order to do this there are certain questions that need to be answered:

- How are information systems designed and introduced to SMEs?
- How can specific requirements be analysed?
- How can the research process be structured?
- Is action research an adequate research method for this type of problem?
- What are the roles and responsibilities of the people involved in the project?
- What additional features would be of interest?
- Can these findings be generalized and therefore of benefit to the scientific community?

- What are the critical success factors for this type of project?

#### 4. A Preliminary Framework for Action Research Projects in SMEs

Within action research projects the focus is on processes of social change. Therefore it is required to understand the roles, relationships and responsibilities of those involved in the project. There is a need for additional abstraction so we enhance the action research cycle by building a framework for introduction of information systems to SMEs.

##### 4.1. Action Research for the design and Evaluation of Information Systems in SMEs

The introduction of information systems to SMEs especially trade constitutes a unique challenge by mixing conventional demands with those particular to trade. It is important to add structure to the task of information systems analysis, development and evaluation. Additionally the task of introducing a project management system in SMEs with the necessary analysis and guidance requires an interventionist approach (Greenwood 1998). The aim is to comprehend the complex human processes involved, to generate an understanding that we immediately apply by linking existing theoretical knowledge to practical experience. On these preconditions with a focus on processes of social change we regard the Susman Action Research Cycle (Susman 1983) a suitable preliminary process model. However action research is often attacked as being too informal. Checkland states that an intellectual framework within which knowledge in the research situation will be defined must be constructed in advance (Checkland 1991, 1995). As our aim is the introduction of an information system in SMEs we turned to Checklands process model for soft systems development (fig. 3). Within his framework Checkland stresses the importance of roles and puts the learning phase out of the cycle by refining actions during the evaluation process. This framework can be seen as an adaptation of the Susman and Evered 1978 cycle with the introduction of roles and an explicit declaration of the framework of (meaningful action) ideas and methodology.

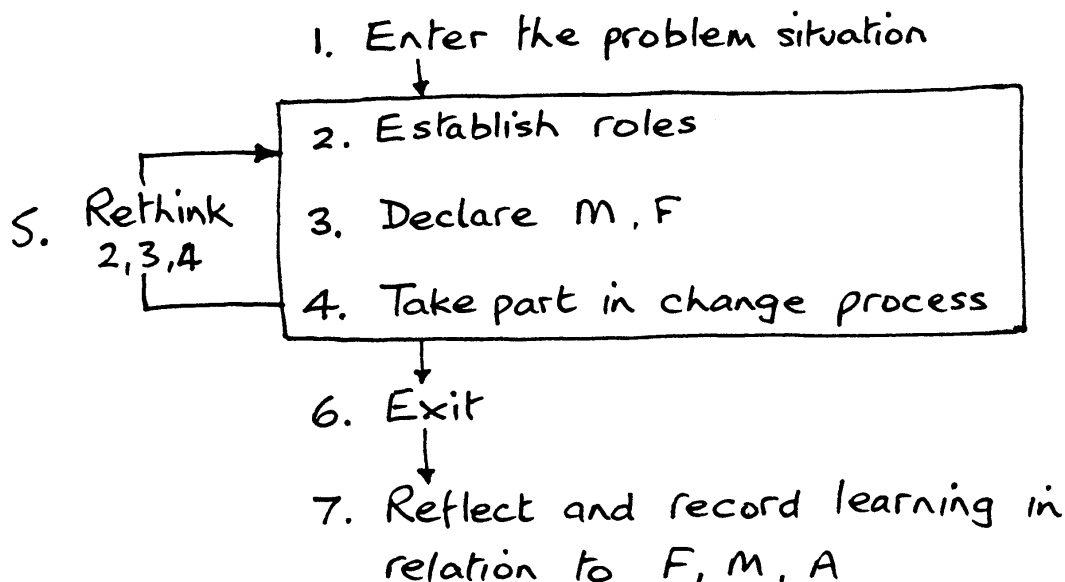


Fig. 3: Checkland Process Model for Action Research

This however is not sufficient for the information systems introduction in SMEs because we need more semantics in our process model. Building on our experience with MEMO the requirements of the Susman cycle and the requirement multiple perspectives (Avison 1998) of we developed the

MEMO Macro Process Model for Action Research. Each phase is described in more detail by its prerequisites, goals, roles, method and results and triggers a micro process (fig. 5) that is again described by an independent cyclical action research process.

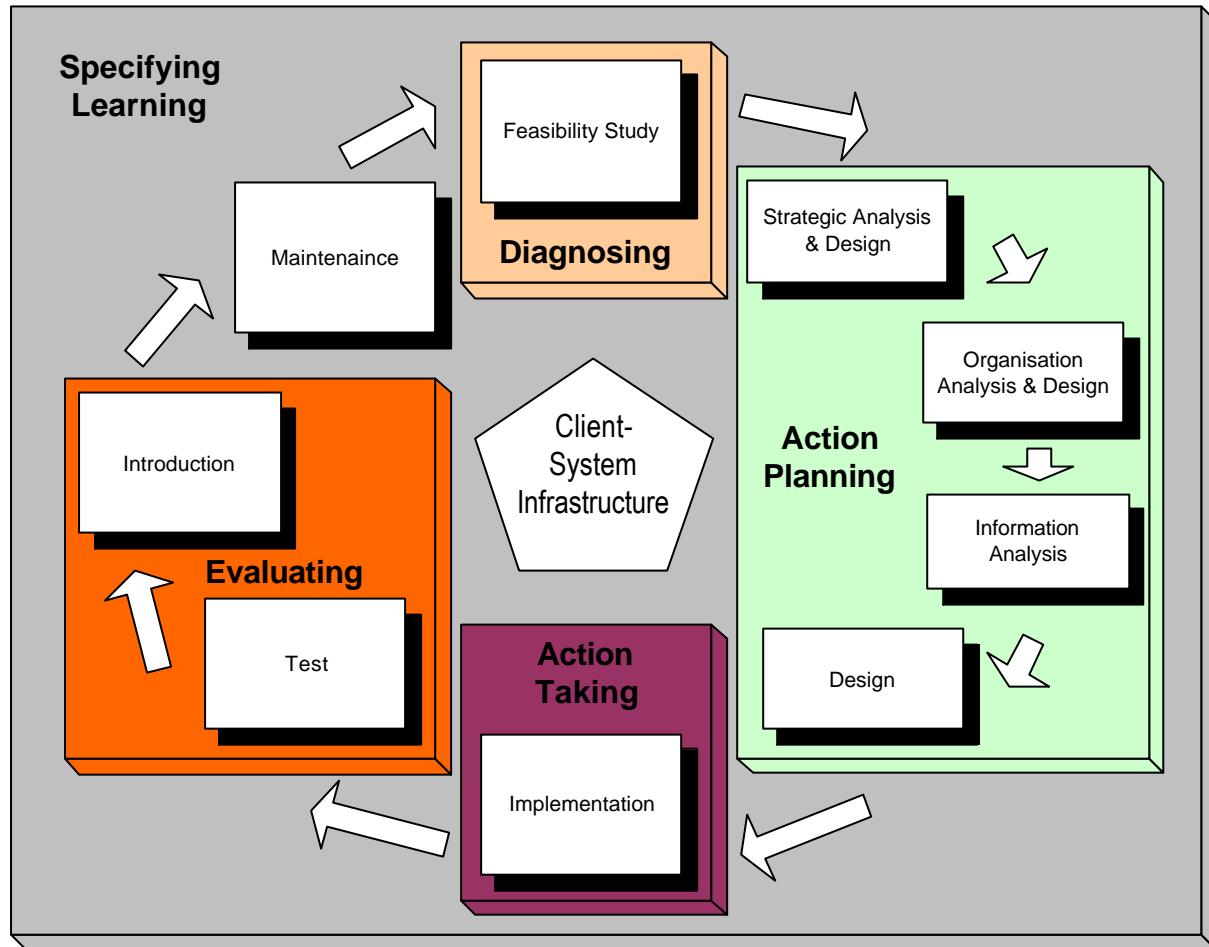


Fig.

4: The Macro MEMO Action Research Process Mode

The starting phase *Diagnosing* aims at identifying the businesses desire for change and the related problems. This needs to be approached in a holistic fashion by evaluating the complex problems of the business (Frank+ 1998). The prerequisites are all available data e.g. corporate accounts, information on the desired state and equally important mutual perceptions, the preferences of relevant stakeholders as well as information on the barriers that need to be overcome. The goal here is a comprehensive understanding of the business, identification of the problem domain and a thorough analysis of the business processes. The roles necessary are researcher in close collaboration with the business owner, master of the trade, head of administration and head of IT. The researcher is involved at all stages. However the complexity of the involvement changes. At this point the method is observation, interview and result specifying. All the other roles involved are subjects of the research and assist in understanding of the business. As a result of this initial process we have a clear, explicit concept of the desired future state of the SME and are positive about the technical, formal and conceptual possibilities to achieve this.

The second phase *Action Planning* is fourfold. In order to build an illustrative framework to specify the desired future state and necessary changes, we utilize the multi perspective perception suggested by MEMO. As prerequisites we build on the findings of the Diagnosing phase. The goal is a detailed description of a target model including the future strategy and organisation of the SME as well as a corresponding information system. Roles involved are researcher, business owner, head of administration, master of trade, head of IT and also the workers in the business. All other

roles involved will need to participate in the evaluation and refinement process of Action Planning under the researchers restrained supervision. The methods are close collaboration, observation, interview, and result specifying. Various analytical processes are usually building on the knowledge of the previous analysis but it might be necessary to analyse the organisation first to find out more about the strategy thus reversing or cross-referencing the order of the analysis. Once finalised the findings are linked and put into perspective with each other thus resulting in a framework and a preliminary design for the future information system.

The prerequisite of *Action Taking* is the framework and design developed in action planning. The aim is implementation of the refined design in the client organisation with the intention of changing the status quo thus making it part of the business. Roles involved are researcher, business owner, head of IT and an external consultant. The method used by the researcher is direct change. This means change is taking place directly within the SME with the business owner involved for a few last minute changes and the head of IT or external consultant for the technical support. The result of this phase is a ready to use information system prototype with documentation of problems or apparent missing features.

The next phase, the *Evaluating* phase, is twofold. The first part, testing, builds on a successful implementation. The goal is to determine whether the target has been reached and the change lead to the specified, desired effect. As there is little hard data to be gained it is especially important to be thorough with the documentation and drawn conclusions. The roles involved are researcher, business owner, master of trade, head of administration, head of IT and also all workers involved. After an introduction of the information system the researcher steps back to observe, analyse and report the effect of the change. At this stage special caution is needed because, depending on the impact of change, this can lead to behavioural problems that could blur the research and as a consequence endanger the whole project (Hughes 1999). It is particularly important to have all promoters on board because in order to get meaningful appraisable results it is required that the system is used as planned. The result of this first part of the evaluating phase is an overview on the impact the introduction has had on the SME. Building on this, the second part of this phase will evaluate the findings more closely and determine if the system is ready for introduction or the refinement process (the MEMO Process Cycle) will have to start. Roles are researcher, business owner, master of the trade, head of administration, head of IT and a selection of the workers. The researcher will interview those impacted by the new system and document the findings for evaluation. Once the feedback is collected the researcher will in close collaboration with the business owner decide whether to introduce the system, restart the cycle or terminate the project.

As all stages of the MEMO Process Model include a micro process and the evaluation process is especially important we describe an exemplary micro process at this point. Both the macro and the micro process are iterative and will be refined and repeated as often as necessary to reach the desired but objective, explicit result. It is necessary to decide whether it is more productive to restart the cycle of the macro or micro process. To verify findings it can be necessary to repeat the evaluation phase. It is important to ascertain that the framework, the resulting implementation, and personal efforts motivated this achievement. Therefore micro diagnosing is concerned with identifying the evaluation challenge and definition of the desired outcome, an objective evaluation of the introduced information system and its impact on the organisation. This cannot be done by reduction or simplification but by developing theoretical assumptions about the desired effect and the problem of how to make them explicit. After the researcher has completed this he works in close partnership with the business owner in the next micro activity, action planning. This specifies the necessary actions finalised in a framework indicating requisite experiments and questions to gain an objective insight to the introduced information system and its consequential impact on the SME. Action-taking then implements this evaluation. This is done by active teamwork between the researcher and the business owner but also involves people concerned with the information system.



However in order to get objective results the researcher will not divulge the evaluation framework to the users of the information system thus making them change catalysts. As a last step the researcher will, in close collaboration with the business owner, evaluate the macro process evaluation by the micro process to ascertain whether the macro process of introducing information systems or the macro evaluation process did not have the desired effect and another iteration of the macro or micro processes is required (Avison 1999).

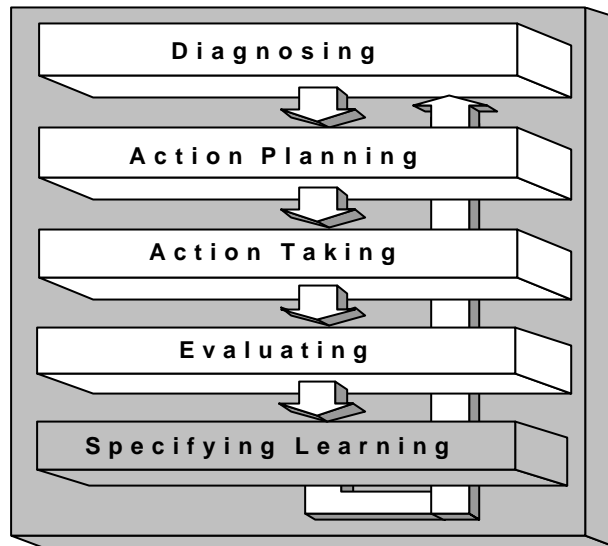


Fig. 5: Micro MEMO Action Research Process Model

*Specifying Learning* is ongoing during all phases of the research cycle and quite independent from the success of the project. The prerequisites for this are any findings during the phases. The results of specifying learning will be used as an additional foundation for successive phases. The goal of *Specifying Learning* is the incorporation of findings into a new scientific framework for related research in other information system projects. Additional findings can be used to restructure the organisational norms to reflect the knowledge gained. This is known as “double-loop learning” (Argyris 1978). The researcher takes the main role because of the theory building nature of this phase. However, it depends on his observation, documentation and analysis in partnership with all other roles involved in the SME. The maintenance task can be seen as part of specifying learning and is particular to information systems. Maintenance will usually take place after the last iteration and involves a learning process.

#### 4.2. Roles and Responsibilities particular to SMEs

The roles of those involved in the design, introduction and evaluation of an information system to SMEs are of specific importance in order to analyse, understand and change the organisation (Bennetts 2000). It is important for the researcher to gain conceptual knowledge by considering possible roles, their mutual perception, their collaborative activity and therefore the impact on the research. The evolving pattern is crucial to a project using a research method that focuses so much on processes of social change.

| Role                       | Success Critical | Experience                                      | Internal/ External | Relevant Phase               | Responsibilities | Characteristic            |
|----------------------------|------------------|-------------------------------------------------|--------------------|------------------------------|------------------|---------------------------|
| <b>Business Owner</b>      | Yes              | Detail knowledge about the enterprise           | Internal           | All Phases                   | SME              | Executer of power in SMEs |
| <b>Master of the Trade</b> | Yes              | Detail knowledge about the “production process” | Internal           | Action Panning<br>Evaluating | Production       | Promoter of Quality       |

|                                |     |                                                                                    |                    |                                       |                                       |                                 |
|--------------------------------|-----|------------------------------------------------------------------------------------|--------------------|---------------------------------------|---------------------------------------|---------------------------------|
| <b>Head of Administration</b>  | Yes | Detail knowledge about the SMEs administrative and fiscal matters                  | Internal           | Diagnosing Action Planning Evaluating | Front- and Back office                | Promoter of financial stability |
| <b>Consultant</b>              | Yes | Providing special knowledge on non routine matters                                 | External           | Action Taking                         | Hardware                              | Depends on focus                |
| <b>Head of IT</b>              | Yes | Administration and implementation of IT and Software in the SMEs IC Infrastructure | Internal/ External | Diagnosing Action Taking              | IT                                    | Depends on attitude             |
| <b>Workers in the business</b> | Yes | Various processes necessary for the SMEs core competence                           | Internal/ External | All Phases                            | Office, production, assembly, support | Operator                        |
| <b>Researcher</b>              | Yes | Technical, Business, SME, Psychological and Research Method                        | External           | All Phases                            | Project, conceptual knowledge         | Promoter of Change              |

*Fig. 6 Roles particular to SMEs*

All roles are critical for the success of introducing information systems in SMEs. It is necessary to identify and understand the pattern of collaborative activity between the individuals, the roles they are taking, their relevant experience, and the relationship with the business and their responsibilities. This does not mean that each role is exclusive to one individual but one person can have more roles and vice versa.

The primary role is business owner or group of owners with one taking the leading role for the project as executer of power in SMEs. He is central for the project because he decides what will be done and defines the business strategy. Constant close collaboration between the researcher and the business owner is necessary. He will need to be involved at all stage. His characteristic is usually patriarchal, visionary and ruler. It is important that he provides access to the relevant documentation and people for a thorough investigation into the business problem domain. He will also be involved in determining the feasibility. He will provide his view on the organisation and the desired future state and help in developing the design. The feedback is crucial because achievements must be evaluated and if required modified.

The next role is master of trade as promoter of quality. His experience of the production process makes him inevitable for action planning. The production process is at heart to the organisation and production quality will usually be of crucial importance for the business strategy. He is heavily involved in the evaluation phase, verifying the proper implementation of his domain in the information system. During all other phases he must be consulted if his expertise is required.

The head of administration takes a similar role. We found that in SMEs this position is often filled by the owners' spouse thus developing a more central position than usual. If the owners' spouse fills this position the involvement is similar to that of the business owner. If filled by a neutral employee it is an important support position because a set of the required information for diagnosing and action planning comes out of the administration domain. A close involvement during evaluation is also relevant to verify the domain representation in the information system.

Some SMEs have consultants for various tasks. Here we focus on those concerned with IT. In this case it is necessary to involve the consultant in action taking because they will remain involved with the business long after the project has been completed. Also the expertise might be useful during the implementation phase. However this calls for a cautious approach because consultants may regard researchers as competitors rather than as partners.

Closely connected with this there is the role head of IT. This is not always an explicit role but can be external. The characteristic can range from technology enthusiast to weary. This role is important during initial diagnosing in order to establish the status quo and is central in supporting action taking because of the implication the introduction has for IT in SMEs.

The last, important role is “friendly outsider” as promoter of change, the action researcher. This role is particularly challenging because it is confronted with conflicting expectations. On the one hand, the “friendly outsider” is supposed to actively promote the desired change of the business, hence, to manipulate the subject of research. That requires to deal with particular organisational and technological problems as well as with idiosyncrasies of other actors participating in the project – in other words: to get involved and committed. On the other hand, his work as a researcher is aimed at objective results that can be generalized in order to be applicable to a wide range of companies. This recommends to keep a critical distance. To manage this conflict, it is important for the researcher to document the findings and also reflect and learn in the action research process. Specifying and learning is especially important to the researcher to generate conceptual knowledge.

The roles of the workers in SMEs are multiple and mostly operational. They are internal as well as contracted and selectively integrated into the research process at all stages as they are closest to possible problems and also need to work the introduced information system. There are important but will not be described in detail because there are not central to the framework.

### **4.3. Critical Success Factors**

One of the challenges of action research is to adequately shape the relationship between researcher and subject of research. This is especially decisive in trade businesses because of the unique structure of those businesses.

The first critical success factor *awareness raising* refers to the mutual consciousness for the different results the researcher and the business owner try to achieve. There is undoubtedly a common element in that researcher and business have the advance of the business central to their impetus but the researcher also wants to gain knowledge about the process and generate conceptual knowledge for future use in other projects and for the scientific community at large (Hult 1980), while the owner has his priority on speed and cost.

The researchers *commitment* to the project is present at all times because it is central to his work while the business has to follow market pressures, deal with minor disasters or simply loses interest. Therefore it is crucial for the researcher to keep the participants involved and interested over a long period to bring the project to a successful end. There is no patent formula but we found that regular communication and reference to common targets does the trick.

*Qualification* of individuals is a key element for the project. Qualification has an influence on the way those involved look at problems and perceive what might be of importance to the experiment or understand the necessary steps to be taken. There is often a separation between those with knowledge and those with responsibilities. An understanding of this subtle difference is indispensable in order to know where to turn for information and where for authority. For the project it is imperative to define responsibilities for roles involved in the project. In general, it would be important to understand the hierarchy but in trade businesses decisions usually go back to the owner or spouse. The researcher must find a way to ascertain knowledge and draw the right conclusions, while the people involved with the business must understand the scope of the problem without being blinded by their day to day routine or misconceptions.

In close relation to this it is equally important to establish a *common language* and level of trust. The common language must enable a critical analysis and response by all the people involved

without the common problem of creating misunderstandings. The ability to communicate and give professional advice to those involved helps developing a necessary basis of trust to start the cycle and introduce measures and technologies that will readily be accepted and applied.

In a project concerned with the introduction of information systems, the *proper evaluation* of information technology and the introduced information system are also important. The researcher must always remember the initial motive of the project and not get carried away by misinterpreting sophisticated technology as an end in itself. Also it is crucial that the business owner does not reduce the system on grounds of cost but aims for the maximum benefit for his business. The actual introduction of technology and its usability are also vital for success. It is necessary to lead people to the system with caution and make benefits obvious from the start. This involves advanced testing to prevent frustration with system breakdowns or faulty systems.

## **5. Conclusion and Future Research**

The introduction of information systems to SMEs requires a thorough investigation, interpretation and judgement of businesses processes. The semantically enhanced MEMO Action Research Process Model provides a framework to acquire a comprehensive understanding of the business. This is achieved in close collaboration with the relevant stakeholders of the business. The research has been a very rewarding experience because of the unusual aspects of combining trade and academe. After an initial phase of weariness the business owners became aware of the benefit in working with us. The pressures of running a business keep them very busy but after the initial period they started calling us for advice and the cooperation has grown into a collegial partnership. Some of the workers in the businesses are still reluctant to adapt what we are doing because they are afraid that it would mean additional work or they just do not like change. But there are also some that are keen to implement the changes. We in turn learned a lot about the structure of small businesses, the team efforts to keep the business a success, the family like mentality, the impact different personalities have and the importance that all measures have a direct impact on the owner and his finances because the company is not an anonymous entity but almost the owner himself. The advantage of this structure is that change is quick and the impact can be promptly assessed. We found that most trade businesses are dynamic, innovative and do great high quality product. It has not always been easy to find the right compromise between involvement and observation and will remain a challenge for the rest of the project.

This satisfying experience encouraged us to bring IS students into the SMEs to assist the research process. Action research with its strong practice orientation creates a perfect opportunity for students to apply their theoretical knowledge. An additional benefit of doing action research in SMEs is that students get an insight into all aspects of business rather than just being part of a department. This will have an additional effect on the research because of the attitude of those in the business towards researchers especially student researches, research in general, academics, the university and information technology as well as the students attitude towards trade which is usually non academic and rarely linked with academe and a different focus on the way things are done.

We found that our project did not only lead to a reengineering of business processes and the introduction of workflows but we also gained detailed knowledge about the business. The idea is that this project knowledge should not be lost but stored for reuse in future projects. For this we have designed a Project Management Memory System (Frank 2001). It guides users with the acquisition and structured representation of project specific knowledge. It also assists the researcher in his documentation because the knowledge for each iteration will be filed and can be looked at in proportion to previous iterations thus recording a history and the lessons learned.

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