DEMAND AND REQUIREMENTS FOR NATURAL LANGUAGE SYSTEMS

Results of an Inquiry

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ABSTRACT

This paper presents the results of a market Inquiry on German natural language systems (NLS), which may provide a basis for discussions about applications of AI systems. Features of application areas in which NLS are desired *are* analyzed and requirements for capabilities of NLS are determined.

A. INTRODUCTION

It is often argued that AI - including NLS - are ready to be applied while at the same time business and industry are ready to apply them. The optimistic view is supported mainly by three points:

- the examples of successful systems like INTELLECT and RI;

- the interest of industry in AI publications and AI conferences, as shown by the increasing number of participants coming from industry (ECAI-82);

- the increasing consulting activities of AI corporations, mainly in the US.

The pessimistic view is supported by those who, in pointing out unsolved problems, warn AI researchers not to engender illusions, which are necessarily followed by disappointment, and not to neglect work on theoretical foundations (AAAI-82). A third point of view comes from outside of AI: studies in the field of Human Factors attempt to prove that strict software engineering is superior to AI techniques, e.g. that natural language is inappropriate for man-machine-interaction. I shall not enter into this debate here. What seems to be lacking is a sound basis for discussion. That is

- empirical data about the demand for available AI products

- empirical data about the need for (perhaps not yet developed) AI products

- empirical data about those features that customers require.

Guided by these considerations, the HAM-ANS project performed a market inquiry in the field of German NLS. This paper presents some of the findings.

B. METHODOLOGICAL QUESTIONS

Of course, there are several methodological questions connected with this market inquiry. First, it is a hypothetical inquiry, i.e. an inquiry about a product type that is not yet available on the German market. During the pretest we discovered that some people did not believe that NLS are even possible. Second, it is an inquiry about a new product type, i.e. not concerning a particular, completed NLS but NLS "as such". Third, it is not a user study but a market inquiry, i.e. the interviewees are potential customers and not the intended users, although they are highly affected by a buying decision. The reactions of the users (acceptance or not) *are* an important basis for the decision of the customers. Fourth, no awareness of linguistic or conceptual facilities could be expected from the interviewees. During the pretest we tried out some methods for collecting the most demanded facilities of a NLS. We found out that most of the potential customers were not interested in these details, how ever they were presented. Perhaps, the intended users are, but this was not a user study. As one interviewee put it: "We'll buy the best system available. But it is your task to find out which system is the best." So, we could only find out

- what is viewed as a benefit of NLS, what is considered a disadvantage, and how the costs *are* assessed;

- in which ways potential customers believe the users to be affected;

- whether potential customers believe that they would invest in NLS, if they were available now;

- in which setting and for what tasks potential customers would like to apply a NLS.

From the analysis of the application areas where NLS are desired some demands on NLS capabilities can be determined. There is yet a fifth methodological problem: whether to conduct a qualitative or quantitative inquiry. We did both.

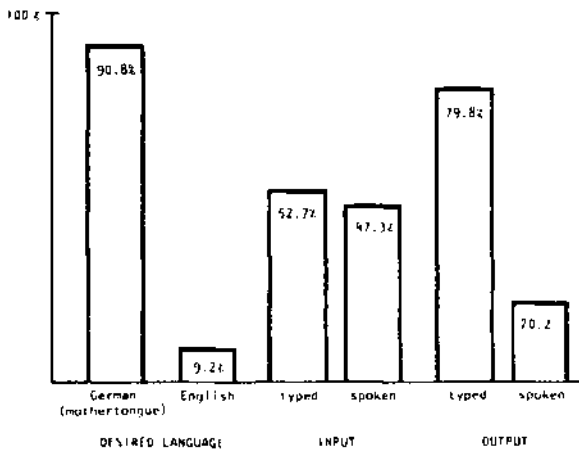|	
personal interviews with experts from leading computer firms, consulting firms, software producers (expert inquiry) (8 firms)	qualitative inquiry
personal interviews with potential customers of NLS (8 firms)	

● inquiry via questionnaire of repre- ⎤ quantitative
sentatively selected public and   ⎬ inquiry
private institutions (927 cases)   ⎦

C.   RESULTS

From 927 questionnaires, 210 were filled out
and sent back. In a quantitative inquiry by mailed
questionnaires, this 22.6% recall quota is very
high, and reflects the interest in AI software
products and the open-mindedness toward new ways of
man-machi ne-interaction.

90.8%		52.7%	47.3%	79.8%	20.%
	9.2%				
German (mothertongue)	English	typed	spoken	typed	spoken
DESIRED LANGUAGE		INPUT		OUTPUT	

We requested only general data in the ques-
tionnaire about NLS themselves. The most important
results *are* listed in the table above. Indirectly,
however, from the analysis *of* the claimed applica-
tion areas, some requirements became clear in more
detail (see 'Setting and tasks').

1.   Cost-Benefit-Analysis

In order to determine the demand for NLS we
asked about their supposed benefits, costs, and
the relation between them. We also took into ac-
count the believed effects on the user, because
this may have influenced the assessment made by
potential customers. 88.6% of the interviewees, in-
dependent of their position, feel that a NLS would
be put to good use at their working place. The most
frequently indicated benefits of NLS were better-
substantiated decision-making (65.4%) and planning
(61.4%). That more people have access to computers
is viewed as beneficial by 57-2%. That the user is
more in control interacting with a NLS (72.0%) and
system's performance will be more transparent
(65-2%) *are* considered advantageous effects on the
user. We may infer from this the importance of an
explanation component.

As disadvantage for the user the increase of
workload because of using NLS is noted by only

16.3% of the interviewees. 43-7% believe that con-
tentment of employees does not increase with the
introduction of NLS, but the opposite is asserted
by 33.2%. Other changes in the users' work routines
were denied by the majority.

A NLS is expected to be expensive - like any
other computer system. 86.8% of the interviewees
reported from experience that computers are expen-
sive, 72.2% supposed NLS to be expensive and 16.3%
didn't know. 52.0% placed the maximal price for a
NLS alone between 50 000 and 200 000 Deutschmark.
Although 69.9% believe that the costs of a NLS
would be greater than the benefits in the short
run, 70.8% would invest, if NLS were now available!
This 'act disposition' does not depend on the trade
or the position of the interviewee. So, there seems
to be a great demand for and positive attitude to-
wards NLS.

2.   Setting and Tasks

The desired application areas for NLS will now
be investigated, showing their implications in
terms of NLS capabilities. A simple model of a NLS
setting was presented to the interviewee:
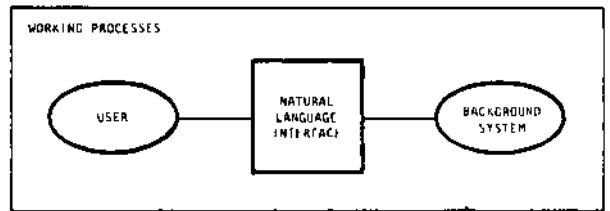
A NLS was judged a useful support for flexible
(indicated by 62.2% of the interviewees) and time
sensitive working processes (71.4%)- It is expec-
ted that the information gets into the information
seeker's hands sooner with the help of NLS. Because
decision processes are often time sensitive it is
not surprising that decision support is the most
demanded function of the overall system for the
working process. 44. 2% of the interviewees marked
decision support as the prime task for a natural
language interfaced system. But also information
supply (32.7%) and administrative support (23-1%)
were named. Decision support is primarily needed
by experts who *are* not programmers, e.g. managers
from all trades, doctors, chemists, etc. But also
at lower levels in a firm's hierarchy decision
support is desired. Clerks may use a system not
only supporting their administrative work but also
aiding in wel1-substantiated decision-making, e.g.
to decide which offer can be made with respect to
resources and follow-up charts. This example,
stemming from the personal inquiries, shows the
close relationship between decision and planning.
Viewing GUS, for example, as a decision-supporting
system, we are familiar with the degree of planning
capabilities expected by the user (Bobrow et al.77).

The most frequently named <u>user type</u> of NLS is the parametric user type (37%). We defined the parametric user (diverging from the definition of Codd, Date 74 as a permanent user whose interactions with the system are part of his/her job, regardless of whether the job is routine or not. Expert users (here: occasional and professionally motivated use of the system) were indicated as typical NLS users by 28.4%, casual users (here: occasional use that does not belong to the job) by 33-2%. As expected, there was a strong correlation between the indication of information supply as system's function and that of casual user as typical NLS user type. And most people who chose 'expert user' marked decision support as the most sensible system function.

The choices for <u>background system</u> were: data base system, expert system, and planning system. Information Retrieval Systems were excluded because their domain is typically too extensive for a knowledge-based NLS to handle. While image interpretation (2.9%) and planning systems (1.2%) were rarely named, expert systems have 23-2% of the votes. Yet, the most often chosen background system for a NLS was a data base system (66.2%). But we suspect that it is not understood as a technically strict term, oriented toward the data base systems now available. All people who wanted direct access via natural language to mass data (52.2%) checked data base system, but nearly a third of the 39.6% who desired access to expert knowledge did so too. Expert knowledge was defined as rule-based knowledge of experience in a limited domain. In which respect could this kind of knowledge appear in a data base context? From the personal interviews it became clear that inferential knowledge about the discourse domain and meta-knowledge about the data base is expected to be attached to the data base system. This may be taken as evidence for the thesis of Tennant (79) that the ease of man-machine-interaction requires the extension of conceptual coverage beyond the limits of data base contents.

Two other capabilities of natural language interfaced systems suggest new directions for research. The system should not only supply information but do something according to the dialog. That data may be changed of brought in in a natural language dialog was declared to be decisive by 58.9% of the interviewees, in the hope that the bottle-neck of data input may thus be overcome. As we know from the work of Salveter, Maier (82) and Mylopoulos et al. (80), natural language update implicitly demands meta-knowledge about changes in the world and meta-knowledge about data base transactions. The task, simple in the eyes of the users, t-urns out to be difficult for those developing the systems. Another requirement for NLS concerns application programs. 40.7% judge as decisive and 52.6% as useful that application programs may be started via natural language. If an advising dialog leads to a decision by the user, the system is expected to fulfill the corresponding tasks. A tax advising expert system like TAXMAN II (McCarty et al.79), for example, should fill in the corresponding tax form. A hotel advising system should not only inform the user about advantages of the hotel but also book a room and do all of the related

bookkeeping, if it is ordered by the user. From the point of view of the customers it seems quite natural that the tasks resulting from a decision supporting dialog with a computer are performed by the same system. Aside from ad hoc solutions for a special application, the realization of this demand requires:

- interprocess communication (in a master-slave mode with the NLS in control)

  transmitting specifications of the user, which were gathered during the dialog as parameters to the application program

  transmitting requests for missing specifications to the NLS, triggering the generation of queries for further information;

- representation of provisional results during the dialog;

- abstract representation of the program's actions;

- representation of real world actions in relation to the implications of verbs (e.g. what does it imply to 'book' a room?)

- understanding of the speech acts 'order' and [1] command'

Coming back to the debate, mentioned above, the conclusion is quite balanced: there is a great demand for NLS but there is also a lot of work to meet these requirements.

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