SWOT ANALYSIS OF COMPUTER BASED EXPERT SYSTEM ON RUBBER – RUBEXS 04

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ABSTRACT

A computer-based Rubber Expert System was developed and abbreviated as RUBEXS-04. The study was conducted among 60 registered rubber growers who were members of the Rubber producers society under the Mannarkkad Regional Office. Simple percentage analysis was used to express the strengths, weakness, opportunities and threats as enumerated by the respondents. With the information shops and village knowledge centres slowly making their presence in many of the villages of the Country, the free usage of a computer based Expert System, can provide a affordable, and efficient means of harnessing information potential by the poorer sections of the rural society. Village knowledge centres also impart Computer literacy to the rural population. Thus it could be observed that many of the strengths of the Expert System outweigh the weakness, and threats, and provide greater opportunities for the farming community, to become torchbearers of this information revolution era.

India is on the verge of a digital revolution. The green revolution has been the corner stone of India's agricultural achievement, transforming the country from one of food deficiency to self sufficiency. Public research and extension played a major role in bringing about the green revolution. However in the post-green revolution era, extension faces important challenges in the areas of relevance, accountability and sustainability (Sharma, 2002). As India prepares itself to face the Challenges of globalization and liberalization, Computer based information technology would be the best and foremost alternative to cater to the diverse needs of the farmers and enrich their knowledge base thus contributing effectively to increased agricultural productivity in the Country. In this context knowledge based Computer programmes or Expert Systems containing "expert knowledge" is a promising means of providing information, and has the ability to capture human decision making expertise, make it inter active and represent this expertise as a series of rules and facts. With this background the present study was undertaken with the objective of conducting a SWOT analysis (assessing the strengths, weakness, opportunities and threats) of the Computer-based Expert System developed on rubber protection technologies as RUBEXS-04.

MATERIALS AND METHODS

A computer based expert system on rubber protection technologies was developed using knowledge engineering and software engineering.

The knowledge engineering methodology included building up of an exhaustive knowledge base on 44 items on plant protection technologies of rubber and the documented knowledge was analysed and grouped in a common knowledge base. The information generated from various sources for knowledge acquisition activities were analysed and it was represented in the form of a flow chart, with the purpose of finding the domain knowledge which the experts were using to reach a conclusion from specific components in the domain layer. The knowledge base was verified at the knowledge acquisition stage, analysis stage and implementation stage and got approved by the expert as a valid way for solving the problem. For the Software engineering methodology Visual Basic 6.0 was selected as a programming language.

RESULTS AND DISCUSSION

A perusal of Table 1 enumerates the various strengths of the Expert System. It could be observed than an overwhelming majority of the respondents (86.67 per cent) opined that practical experience and knowledge of human expert could be stored and used for longer period of time. It is possible to accumulate and integrate the knowledge and expertise from diverse sources like agricultural specialists and yeomen services of retired experts and their problem solving behaviour could be well simulated in agriculture. Besides it could be observed that 81.67 per cent of the respondents identified Expert System as powerful tool with extensive potential to aid in quick decision making in agriculture.

Slightly more than three-fourths (76.67 per cent) of subjects were of the opinion that self learning was possible through Expert System. They were of the opinion that the navigation tools available in the Expert System could be successfully used and they could operate the System with little support due to its user friendly nature. Further it could be observed that 73.33 per cent of the respondents were highly convinced about the diagnostic results, and convinced with the advice and details on plant protection aspects of rubber crop. This result is in agreement with Nuthall and Bishop-Hurley (1996) who reported that the farmers in general agree with the advice and explanations provided by the three Expert Systems developed for components of the overall feed management problems.

Slightly less than two-third (65.00 per cent) of the subjects expressed the strength of Expert System as "highly interactive", since it made the subjects as active participants by asking questions related to the plant protection aspects of rubber till the diagnosis.

Further perusal of the table indicates that 60.00 per cent of the respondents expressed that with the correct use of RUBEXS-04, farmers will be able to solve simple problems such as pest and disease in rubber crops by themselves and also call upon the services of the specialists and extension officers only in the case of doubt or when problem of more serious nature. Thus 60.00 per cent of the respondents expressed that Expert System saves both money and time. Further it could be observed from the table 38.33 per cent expressed that Expert System reduces the dependency of human experts. The remaining 61.67 per cent of the subjects felt that Expert System cannot totally replace the human experts.

Weakness of expert system

A perusal of Table 2 gives the weakness of Expert System as identified by the respondents. Cent per cent (100.00 per cent) of the respondents expressed Computer and

other accessories are required to utilize Expert System. It was followed by 98.33 per cent of the respondents who felt that the next most weakness was that it required regular update, whenever situation changes. This might be because the expert system was designed considering the present situation and required updating at regular intervals.

The other weakness of Expert System was identified by 96.67 per cent of the respondents who opined that skilled personnel were required to update the knowledge base of the Expert System. This finding is in agreement with the findings of Senthil Kumar (2003) who revealed that modem communication techniques required more skill to operate. Other weakness of Expert System identified by the respondents in order of succession were Computer literacy to farmers, need power supply, language barriers and low credibility in the diagnostic results.

Opportunities in using expert system

It could be observed from Table 3 that 81.67 per cent of the respondents opined that steady growth of information communication would help to use the Expert System in future. Declining trend in the cost of Computer and other accessories was yet another opportunity expressed by 78.33 per cent. This may be attributed to the reason that Information Technology (IT) continues to develop at a rapid pace and in the long run Personal Computers, Cell phones and internet would become cheaper, slightly more than two-third of the Subjects (76.67 per cent) expressed that there is an opportunity to bridge the gap between Scientists knowledge and farmers through Expert System. The knowledge of the innumerable number of Scientists working in the various State Agricultural Universities, Research Institutes, Krishi Vigyam Kendras, National Research Centres, and Other Research Centres could be harnessed by making use of the Expert System and there by the gap between Scientists knowledge and farmers could be possibly narrowed down.

The other opportunities in using the Expert System were promotion of Computer literacy among Children of farmers in rural areas, increase the literacy level of Indian farmers, potential to develop the Expert System in local languages, use of Solar power/battery operated backups to run the expert system and to update the knowledge base of the Expert System.

Threats in using expert system

A perusal of Table 4 illustrates the various threats in using the Expert System. It is interesting to note from the table that a majority (86.67 per cent) of the Subjects had expressed that the greatest threat posed by the Expert System was the wrong gathering of knowledge and representation which leads to improper diagnosis of the problem. This may be due to the fact that the collected knowledge might include many facts, principles, prejudices, beliefs and heuristics which are not easily and readily available for decision-making. This specialized knowledge is stored in the knowledge base which is the heart of an Expert System. Hence the correct decision-making totally depends on the appropriate representation techniques used for representing this principal knowledge. The other threats identified in using the Expert System were non reliability of the Information Communication Technology due to operational problems as opined by 43.33 per cent of the respondents, followed by 18.33 per cent of the respondents

who where of the opinion that viruses cause corruption of files and result in hanging over of the System.

CONCLUSION

Two thirds of the Indian population is constituted by farm families. In order to keep the farmers well informed about the latest agricultural technologies, quality literacy (Sanitary and Phytosanitary measures), trade literacy (demand-supply and price situation) and legal literacy (IPR, farmers rights) in the context of the WTO regime, initiation of an era of knowledge intensive agriculture is called for. Computer based Expert System provides the best solution to make expertise available to farmers and agricultural advisors to solve Computer problems by its dynamic and heuristic strategies.

With the information shops and village knowledge centres slowly making their presence in many of the villages of the Country, the free usage of a computer based Expert System, can provide a affordable, and efficient means of harnessing information potential by the poorer sections of the rural society. Village knowledge centres also impart Computer literacy to the rural population. Thus it could be observed that many of the strengths of the Expert System outweigh the weakness, and threats, and provide greater opportunities for the farming community, to become torchbearers of this information revolution era.

REFERENCE

Sharma, Rita (2002) Reforms in Agricultural Extension – New policy framework. Economic and political weekly, July 27, pp. 3124-3129.

Table 1. Strengths of expert system

(n=60)

S.No.	Items	Numbers	Per cent
1.	Practical experience and knowledge of human expert can be stored and used for longer period of times	52	86.67
2.	Helps for quick decision making	49	81.67
3.	Self learning is possible	46	76.67
4.	Highly convinced about diagnostic result	44	73.33
5.	Highly interactive	39	65.00
6.	Saves money	36	60.00
7.	Saves time	36	60.00
8.	Reduces the dependency of human expert	23	38.33

Table 2. Weakness of expert system

(n=60)

S.No.	Items	Numbers	Per cent
1.	Requires Computer and other accessories	60	100.00
2.	Needs regular update, whenever situation changes	59	98.33
3.	Skilled personnel required to update the knowledge base of the Expert System	58	96.67
4.	Computer literacy is required to operate	18	30.00
5.	Useful for only literate farmers	17	28.33
6.	Need Power Supply	16	26.67
7.	Language barrier	13	21.67
8.	Low credibility in the diagnostic result	12	8.37

Table 3. Opportunities in using expert system

(n=60)

S.No.	Items	Numbers	Per cent
1.	Steady growth in information communication would help the respondents to use the Export System in future	49	81.67
2.	Declining trend in the cost of Computer and other accessories	47	78.33
3.	Possible to bridge the gap between knowledge of Scientists and that of farmers	46	76.67
4.	Widespread Computer literacy noticed among Children of farmers in rural area	40	66.67
5.	Literacy level of Indian farmers is at an increasing pace	38	63.33
6.	Potential to develop Expert System in local languages	32	53.33
7.	Solar Power/battery operated backups can be used to run the Computer System	29	48.33
8.	Possible to update the knowledge base of the Expert System	22	36.67

Table 4. Threats in using the expert system

(n=60)

S.No.	Items	Numbers	Per cent
1.	Wrong knowledge gathering and representation lead to wrong conclusion	52	86.67
2.	Cannot rely upon the ICT, sometimes creates operational problems	26	43.33
3.	Viruses causes corruptions in files and hang over of System	11	18.33