

# Empowering Knowledge: Design and Development of Expert Systems with Shell Programs

Manmeet Kaur Arora<sup>1,\*</sup>, Sahil Lal<sup>1</sup>, Bhupinder Singh<sup>2</sup>

## Abstract

*Even if one never intends to write scripts, mastery of shell scripting is an essential skill for anybody hoping to advance in system administration. For instance, a Linux computer uses the shell scripts to start services and restore system settings when it first boots up. Gaining an in-depth understanding of these starting scripts facilitates the analysis and possible optimization of system behavior. Because scripts may be written in short bursts and there are not many shell-specific operators and choices to learn, learning shell scripting is not too difficult. With only a few criteria to go by, the syntax is simple and evocative of chaining commands at the command line. Most simple programs launch immediately, and debugging lengthier scripts is not too hard. Early microcomputers could be programmed with basic computing abilities thanks to the BASIC language. This was the era of personal computing. These days, anyone with a little knowledge of Linux or UNIX can accomplish the same on contemporary systems thanks to the bash scripting language.*

**Keywords:** Shell, bash scripting language, UNIX, technological trends, cloud computing, big data

## INTRODUCTION

Expert systems are intelligent computer programs that have the ability to mimic human experts in decision-making capacity in a specific domain [1]. It offers a streamlined approach for designing and developing these systems by using shell programs, structuring workable applications without starting from the scratch [2]. This paper analyzes the empowerment of knowledge with inclusion of design and development of expert systems with shell programs [3].

## TECHNOLOGICAL TRENDS IN EXPERT SYSTEMS

1. *Integration of machine learning:* Introduction of machine learning algorithms in expert system increases the flexibility to adapt and capable to decision making, permitting for continuous learning and improvement [4].
2. *Inclusion of natural language processing:* Incorporation of natural language processing leads to interaction of users in more human-like manner, which further increase the user experience and accessibility [5].
3. *Analysis of big data:* Expert systems enable big data analysis within expert systems further enabling the process of vast amounts of data to derive valuable perceptions and make tangible decisions [6].
4. *Cloud computing:* The use of cloud computing infrastructures increases the scalability and accessibility of the expert systems, allowing seamless deployment and integration across various platforms [7].

### \*Author for Correspondence

Manmeet Kaur Arora

E-mail: manmeet.champ@gmail.com

<sup>1</sup>Research Scholar, School of Law, Sharda University, Greater Noida, India

<sup>2</sup>Professor, School of Law, Sharda University, Greater Noida, Uttar Pradesh, India

Received Date: April 30, 2024

Accepted Date: May 15, 2024

Published Date: July 04, 2024

**Citation:** Manmeet Kaur Arora, Sahil Lal, Bhupinder Singh. Empowering Knowledge: Design and Development of Expert Systems with Shell Programs. Journal of Advances in Shell Programming. 2024; 11(2): 1–4p.

5. *The involvement of explainable artificial intelligence (AI)*: The importance of explainable AI in expert systems aims for transparency in decision-making processes, enabling users to interface the users experience and accessibility [8].

## **DESIGNING FLEXIBLE AND ACCESSIBLE EXPERT SYSTEMS SHELLS**

Expert system enables a prebuilt framework for the programmers, developing experts' systems which effectively reduce the time and efforts required as compared to building the whole system from the starting [9]. These shells differentiate the knowledge base from the inference engine, enabling non-programmers to shape experts' systems by providing domain-specific knowledge without any exclusive coding [10].

## **KEY ADVANTAGES OF EXPERT SYSTEM SHELLS**

1. Leveraging standardized functionality resulting in reduced development time.
2. Easy access to domain experts and programmers.
3. Ability to modify the knowledge base in the need of updating and maintenance independently [11].

## **EVALUATING EXPERT SYSTEM SHELLS**

Evaluating the expert systems shells points out the important criteria which includes the knowledge, area representation capabilities, inference mechanisms, e-environment development, support, cost effectiveness and over all functionality [12, 13]. On the other hand, evaluating shells can be very challenging as performance should be assessed in the specific way and context of the use [14, 15].

## **EMERGING APPLICATIONS AND DESIGN CONSIDERATIONS**

The expert systems sought increasing applications in domain like real-time issues diagnosis, monitoring process, and communications at technical levels [16, 17]. The crucial aspect of the flexibility and accessibility in design expert system [18]. To aim for the rapid developments of expert's systems by different users, including domain experts and technical communicators, this shell provides a standardized but customizable framework [19, 20]. Following are the key components of an expert system shell:

*The core components of the expert system:*

- Representation of knowledge base [21]
- Inference engine [22]
- User interface [23]
- Explanation facilities [24]

## **CONCLUDING REMARKS: EMERGING APPLICATIONS AND DESIGN CONSIDERATIONS**

As expert systems find increasing applications in domains like real-time fault diagnosis, process monitoring, and technical communication [25], the design of flexible and accessible expert system shells will be crucial [26]. These shells should provide standardized yet customizable frameworks to enable rapid development of expert systems by diverse users, from domain experts to technical communicators. Generally, scripts can be used to achieve several tasks. Only a few are listed here: to create your own command/tool; monitor several tasks like disk usage, etc.; taking data backups and snapshots. Shell script usage has not reduced, instead it has increased over the years [27]. Most of the middleware tools such as ETL (extract, transform, and load), MB (Megabits) etc. are installed in Unix servers [28]. To maintain those servers, preprocessing file, log collection and performance improvement shell scripts are used. Shell scripting is something that will not go out of fashion till Unix/Linux are in use (and you can be assured that they will be in use for many more years). Shell scripting continues to play a significant role in today's IT industry. It is widely used for automating repetitive tasks, system administration, and managing complex workflows [29]. With the rise of DevOps and cloud computing, the importance of shell scripting has only increased. Many organizations rely on shell scripts to automate deployment processes, manage infrastructure, and handle various system tasks. Additionally, shell scripting is often used in combination with other programming languages to create powerful and

efficient automation solutions [30]. Overall, the scope of shell scripting in the IT industry remains broad and essential. Shell scripting is not a technology or a tool [31]. It is a method of interacting with the operating system, much like a GUI (graphical user interface), but more powerful. Before we had fancy displays and powerful computers, the only way we could use a computer was through a command line, and before that, one had to use punch cards along with printers and scanners (this is why a lot of languages use or something similar as the nomenclature for console input/output) [32]. It is important to note that bash is not the only shell scripting language (which is a common misconception among beginners), even Python or Ruby can be used for the same [33].

## REFERENCES

1. Singh B, Kaunert C. Future of digital marketing: hyper-personalized customer dynamic experience with ai-based predictive models. In: Khang A, Dutta PK, Gupta S, Ayedee N, Chatterjee S, editors. *Revolutionizing the AI-Digital Landscape: A Guide to Sustainable Emerging Technologies for Marketing Professionals*. New York, NY, USA: Routledge; 2024. pp. 189–203.
2. Gierlich-Joas M, Baiyere A, Hess T. Inverse transparency and the quest for empowerment through the design of digital workplace technologies. *J Assoc Inform Syst*. 2024. Preprint 131. doi: 10.17705/1jais.00879.
3. Singh B, Kaunert C, Vig K. Reinventing influence of artificial intelligence (AI) on digital consumer lensing transforming consumer recommendation model: exploring stimulus artificial intelligence on consumer shopping decisions. In: Musiolik T, Rodriguez R, Kannan H, editors. *AI Impacts in Digital Consumer Behavior*. Hershey, PA, USA: IGI Global; 2024. pp. 141–169. doi: 10.4018/979-8-3693-1918-5.ch006.
4. Bisessar R, Reid D. *Designing Futures by Empowering Novice Designers*. Master's Thesis. Toronto, Ontario, Canada: OCAD University; 2024.
5. Singh B, Kaunert C. Salvaging responsible consumption and production of food in the hospitality industry: harnessing machine learning and deep learning for zero food waste. In: Singh A, Tyagi PK, Garg A, editors. *Sustainable Disposal Methods of Food Wastes in Hospitality Operations*. Hersher, PA, USA: IGI Global; 2024. pp. 176–192.
6. Yang B, Jiang S, Xu L, Liu K, Li H, Xing G, Chen H, Jiang X, Yan Z. DrHouse: an LLM-empowered diagnostic reasoning system through harnessing outcomes from sensor data and expert knowledge. arXiv preprint arXiv:2405.12541. Available at <https://arxiv.org/abs/2405.12541>.
7. Guo L, Li X, Yan F, Lu Y, Shen W. A method for constructing a machining knowledge graph using an improved transformer. *Expert Syst Appl*. 2024; 237: 121448.
8. Rani S, Srivastava G. Secure hierarchical fog computing-based architecture for industry 5.0 using an attribute-based encryption scheme. *Expert Syst Appl*. 2024; 235: 121180.
9. Ali KA, Mohin SK, Mondal P, Goswami S, Ghosh S, Choudhuri S. Influence of artificial intelligence in modern pharmaceutical formulation and drug development. *Future J Pharm Sci*. 2024; 10 (1): Article 53.
10. Dirik HF, Seren Intepeler S. An authentic leadership training programme to increase nurse empowerment and patient safety: a quasi-experimental study. *J Adv Nurs*. 2024; 80 (4): 1417–1428.
11. Alshahrani R, Yenugula M, Algethami H, Alharbi F, Goswami SS, Naveed QN, Lasisi A, Islam S, Khan NA, Zahmatkesh S. Establishing the fuzzy integrated hybrid MCDM framework to identify the key barriers to implementing artificial intelligence-enabled sustainable cloud system in an IT industry. *Expert Syst Appl*. 2024; 238: 121732.
12. Froes P. *Software Diagnosis as Intelligent Technologies in Industrial System Maintenance*. TechRxiv. March 29, 2024. doi: 10.36227/techrxiv.171173911.11355438/v1.
13. Mirchandani R. *Empower to Enslave: Decoding Intentions for Product Design and Demand Forecasting*. Partridge Publishing; 2024.
14. Carpentras D, Hänggli R, Helbing D. Collective intelligence for democracy: empowering minorities and everyone in participatory budgeting. Preprint. May 18, 2024. doi: 10.2139/ssrn.4832498.
15. Tonle FB, Niassy S, Ndadji MM, Tchendji MT, Nzeukou A, Mudereri BT, Senagi K, Tonnang HE. A road map for developing novel decision support system (DSS) for disseminating integrated pest management (IPM) technologies. *Computers Electron Agric*. 2024; 217: 108526.

16. Yang Z, Zeng W, Jin S, Qian C, Luo P, Liu W. AutoMMLab: automatically generating deployable models from language instructions for computer vision tasks. arXiv preprint arXiv:2402.15351. Available at <https://arxiv.org/abs/2402.15351>
17. Ma S, Chen Q, Wang X, Zheng C, Peng Z, Yin M, Ma X. Towards human-AI deliberation: design and evaluation of LLM-empowered deliberative AI for AI-assisted decision-making. arXiv preprint arXiv:2403.16812. Available at <https://arxiv.org/abs/2403.16812>
18. Almatrafi O, Johri A, Lee H. A systematic review of AI literacy conceptualization, constructs, and implementation and assessment efforts (2019-2023). *Computers Educ Open*. 2024; 6: 100173.
19. Abaku EA, Edunjobi TE, Odimarha AC. Theoretical approaches to AI in supply chain optimization: pathways to efficiency and resilience. *Int J Sci Technol Res Arch*. 2024; 6 (1): 92–107.
20. Luu RK, Arevalo S, Lu W, Ni B, Yang Z, Shen SC, Berkovich J, Hsu YC, Zan S, Buehler MJ. Learning from nature to achieve material sustainability: generative AI for rigorous bio-inspired materials design. *An MIT Exploration of Generative AI*. March 27, 2024. doi: 10.21428/e4baedd9.33bd7449.
21. Holst J, Grund J, Brock A. Whole institution approach: measurable and highly effective in empowering learners and educators for sustainability. *Sustain Sci*. 2024; 19: 1359–1376.
22. Carminati JYJ, Holth K, Ponsford JL, Gould KR. Co-designing positive behaviour support (PBS + PLUS) training resources: a qualitative study of people with ABI, close-others, and clinicians' experiences. *Brain Impair*. 2024; 25 (2): IB23060.
23. Rowan W, McCarthy S, Mebrahtu S, Ertiö T, Dimova A, Asenova D, Moraitis N, Revez A. Promoting active citizen engagement in sustainable energy transitions: a co-creation approach. *J Decis Syst*. 2024: 1–12. doi: 10.1080/12460125.2024.2344872.
24. Cantarero-Arevalo L, Kaae S, Jacobsen R, Nielsen A, Slyngborg L, Smistrup N, Kastrup LM, Hämeen-Anttila K, Strömberg A, Nørgaard LS. Empowering patients as co-researchers in social pharmacy: lessons learned and practical tips for meaningful partnership and impact. *Res Soc Admin Pharm*. 2024; 20 (3): 372–376.
25. Bai Z, Fang Y, Chen H, Chen X, An N, Zhang M, Rui G, Jin J. Development of an evaluation tool for age-appropriate software in aging environments: a Delphi study. arXiv preprint arXiv:2402.03933. Available at <https://arxiv.org/abs/2402.03933>
26. Hassan AE, Lin D, Rajbahadur GK, Gallaba K, Cogo FR, Chen B, Zhang H, Thangarajah K, Oliva GA, Lin J, Abdullah WM, Jiang ZM. Rethinking software engineering in the era of foundation models: a curated catalogue of challenges in the development of trustworthy FMware. arXiv preprint arXiv:2402.15943. Available at <https://arxiv.org/abs/2402.15943>
27. Salimi-Bani M, Pandian V, Vahedian-Azimi A, Moradian ST, Bahramifar A. A respiratory critical care nurse training program for settings without a registered respiratory therapists: a protocol for a multimethod study. *Intensive Crit Care Nurs*. 2024; 82: 103662.
28. Liu C, González VA, Lee G, Cabrera-Guerrero G, Zou Y, Davies R. Integrating the last planner system and immersive virtual reality: exploring the social mechanisms produced by using LPS in projects. *J Construct Eng Manage*. 2024; 150 (7): 04024070.
29. Lachney M, Green B, Yadav A, Drazin M, Allen Kuyenga MC, Harris A. Sparring with technology: collaborating with coaches, mentors, and academic staff to develop culturally responsive computing education for a youth boxing program. *Educ Technol Res Dev*. 2024; 72: 1563–1595.
30. Zhao T, Gasiba T, Lechner U, Pinto-Albuquerque M. Thriving in the era of hybrid work: raising cybersecurity awareness using serious games in industry trainings. *J Syst Softw*. 2024; 210: 111946.
31. Indira R. Educational Design Recommendations to Improve the Training Programme for New Operators of Pyrolysis Plants. Master's Thesis. Enschede, Netherlands: University of Twente; 2024. Available from <https://essay.utwente.nl/98495/>
32. Huang R, Lin H, Chen C, Zhang K, Zeng W. PlantoGraphy: incorporating iterative design process into generative artificial intelligence for landscape rendering. In: *Proceedings of the CHI Conference on Human Factors in Computing Systems*, Honolulu, HI, USA, May 11–6, 2024. pp. 1–19.
33. Liu WSK. Global leadership dynamics: refining executive selection in multinational corporations. *J Knowledge Econ*. 2024; 1–45. doi: 10.1007/s13132-024-01794-3.