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# Enterprise Resource Planning Systems in Iran:
## A Profile of the Behko Software House

Maryam Rezaeian, University College London, UK
Martin George Wynn, University of Gloucestershire, UK*
https://orcid.org/0000-0001-7619-6079

## ABSTRACT

Enterprise resource planning (ERP) software packages have been widely implemented in the developed world since they first appeared on the market in the late 1970s. In the developing world, however, the lack of the human and financial resources needed for such projects, and the non-availability of sales and support offices for Western-based ERP vendors, has limited the uptake of ERP software. However, in Iran, there has been significant recent growth in the development of homegrown ERP software solutions. These products are usually more customizable than Western-based ERP products and can thus be adapted more readily to specific user requirements. Using a case study approach, this article examines the origins and development of one of these companies, the Behko software company, and assesses its main product and how it has been implemented in a typical end-user company. The article concludes that the homegrown ERP sector in Iran is making a significant contribution to the provision of information systems in the country and is competing successfully with Western-based alternatives.

## KEYWORDS

Behko, Case Study, Enterprise Resource Planning, ERP, Information Systems, Iran, Process Change, Software House

## INTRODUCTION

Since the turn of the century in the developed world, there has been an increase in the use of Enterprise Resource Planning (ERP) software packages, not only by large corporations, but also by small to medium sized enterprises (SMEs). Muir (2015) notes "in recent decades, ERP systems have become 'must-haves' for many organizations. They not only enable the integration of business processes and information, but also provide a unified view of the company and its departments and functions, as well as manage all resources, such as human resources (HR) and finances" (p.1). To date, however, this has not been fully matched in developing world countries, largely because of the human and financial resources needed for such projects. Nevertheless, recent case study research points to the increased deployment of ERP packages in developing world countries in recent years, albeit there have been both significant failures (Hawari & Heeks, 2010), as well as some qualified successes (Akeel & Wynn, 2015). The COVID-19 pandemic has only served to emphasise the value of an integrated and effective ERP solution that processes all business transactions and generates operational and management information.

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In the western world, the ERP market is dominated by a few main players. A 2019 report identified four "tier 1" ERP vendors: SAP, Oracle, Microsoft and Infor. The report found 30% of surveyed ERP customers selected SAP, followed by Microsoft Dynamics at 29%, Oracle at 25% and Infor at 16% (Greenwood Village, cited in O'Donnell, 2019, para. 2). In Iran, there have been some examples of western-based software package implementations, notably the Oracle ERP product at the Isfahan Steel Company (Moohebat et al., 2011), the SAP ERP package at IranKhodro, the Microsoft Dynamics system at Irancell and in the Waikiki Cotton Company, and the Sage package at Rightel. However, there has been significant recent growth in the development and implementation of homegrown ERP software solutions, sometimes called "total systems", aimed almost exclusively at the home business market (Rezaeian & Wynn, 2016). These products are usually more customizable than western-based ERP products and can thus be adapted more readily to specific user requirements; they are also available in both the Parsi and English languages. This article examines the origins and development of one such company operating in Iran - the Behko software company - and assesses its main ERP product and how this has been implemented in a case example company (the Esfahan Bus Company).

This introductory section is followed by a discussion of the relevant background literature and research questions are set out. An outline of the research method is then provided, and the next two sections focus on the Behko software house and the case example of the implementation of its main ERP product. A summary of the findings is then set out in answer to the three reaserch questions. The final section summarises some of the key points and identifies areas for future research in this field.

## ERP IN DEVELOPING WORLD CONTEXTS

ERP software is normally structured in a series of "modules" (e.g. Finance, Sales and Marketing etc.) which share a common database and are built around business processes. Data and information are usually accessed in real time, drawn from the underlying database, which thus provides "one version of the truth" and avoids data discrepancies for users operating in different areas of the company. ERP software can be implemented in stages, module by module, or in one go – often termed the "big bang" approach. The implementation of an ERP package usually requires the application of certain disciplines within main business processes, and is considered as a fundamental method for achieving best practice within business operations by some researchers (Koch, 1999; Soh & Sia, 2004). Winkelmann (2012) observes that many companies have introduced ERP systems as a key part of their buisness strategy and to stay competitive.

The implementation of an ERP system is sometimes viewed as a form of technology innovation that contributes to the technology maturity of a company: the capabilities and processes of a company can often be improved by the implementation of an ERP system (O'Leary, 2009; Grube & Wynn, 2019). According to Turban et al. (2002), an ERP project not only demands and provides business discipline, but also allows the alignment of information systems (IS) with overall business strategy and business goals. Implementing an ERP software package may therefore also require changes in core business processes, often termed business process reengineering (Hammer & Champny, 1993). The implementation and establishment of an ERP solution within a company thus requires a structured and controlled approach (Holland & Light, 1999; Scheer & Habermann, 2000).

In the first decade of this century, advances in systems architecture and database technology added new dimensions to the development and deployment of ERP systems (Krafzig et al., 2005; Maurizio et al., 2007). More recently, the advent of "cloud computing", which allows users to access their main systems via the internet - located off-site ("in the Cloud"), has ushered in variations of ERP products that are available via Software as a Service (SaaS) and/or Platform as a Service (PaaS) arrangements with the software vendors or other third-parties (Mell & Grace, 2011; Nguyen & Luc, 2018). PaaS provides users with access to a hardware platform, operating system and network connectivity via the Cloud, but not the application (i.e. the ERP system) or the data held within, which must be managed by the user company or other third party (Simmon, 2018). SaaS, on the

other hand, also provides users with access to the ERP system itself, and the data held therein, via the Cloud. This illustrates the continuing relevance of ERP products in the digital age. Computing Research (2020), for example, recently concluded "the migration of ERP to the cloud is likely to be part of much wider digital transformation in organisations", and that "migration is almost always going to be part of this much further reaching process of change" (p.5).

There are different views regarding the suitability of software developed in the western world for developing world business environments. Despite some evidence of failure in the adoption of IS, the overall deployment of ERP (and IS in general) is increasing in the developing world. Noudoosbeni et al. (2010) conclude that uprating professional competencies through appropriate training is a key component of successful IS project implementation, and that lack of planning and management as well as inadequate training led to IS project failure in their specific area of study (Malaysian companies). In Iran, a range of issues has hampered IS deployment in the country - lack of managerial skills, low IT maturity, poor training, poor internet access, governmental policies, and poor business planning (Shahin et al., 2010; Hanifzade & Nikabadi, 2010; Amid et al., 2011). Other researchers (Dixit & Prakesh, 2011) have suggested that the lack of human capability and economic conditions in developing countries lead to IS failure and prevent overall economic growth.

There nevertheless appears to be a significant market for ERP software, particularly in SMEs, in the developing world. The studies of Dezar and Ainin (2010) and Arabi et al. (2013) indicate that 90% of businesses in developing countries are SMEs; but adoption of ERP systems by SMEs in developing countries is a relatively recent undertaking, in part due to the high expense and the technical complexity of such systems. Iran illustrates the potential of ERP systems in a developing world environment. Talebi (2007) reports that the great majority of businesses in Iran are micro, small and medium-sized enterprises. According to Molanezhad (2010), the majority of SMEs in Iran are in the manufacturing sector. He also suggests that due to the location of Iran in the Middle East, its access to Russia, Europe and Asia, and its considerable market size, ERP systems have significant potential in supporting Iranian SMEs grow their business and increase their employment. Hakim and Hakim (2012) assert that "IT, as a new industry in Iran, has not found its rightful place within organizations, as the managers are still adamant and adhere to the traditional management systems, and show resistance to the required organizational and infrastructural changes" (p.206). Roozbahani et al. (2014) also discuss the problems of integration in information systems implementation in Iran, highlighting the importance of project management and project leadership in bringing about successful project outcomes.

However, the provision of ERP software by Iranian companies is a significant aspect of the technology business in the country. In part because of the imposition of Western sanctions, many user companies have been unable or unwilling to acquire overseas technology products, which has given rise to the growth of home-based technology companies. In the ERP field, there is now a wide range of companies offering ERP solutions, particularly for SMEs (Table 1).

Within this context, this paper addresses the following research questions (RQs):

- RQ1: What were the origins of the Behko software house and how has it evolved in recent years?
- RQ2: What are the main characteristics of the Behko ERP product and what support services are available?
- RQ3: How has the product been implemented and what lessons can be learnt about the implementation process?

## RESEARCH METHODOLOGY

This paper focuses on the Behko software house and its interaction with a major client – the Esfahan Bus Company (EBC). As such, it is a form of case study, which as Eisenhardt (1989, p. 534) suggests, can be "a research strategy that focuses on understanding the dynamics present within single settings."

**Table 1.** *Iranian software companies providing homegrown ERP systems (with vendor web addresses)*

| SOFTWARE HOUSE | WEBSITE |
|---|---|
| BEHKO | http://www.behko.com |
| GREEN/ GALAX | https://www.greendataware.com/ |
| PARS ROYAL | http://parsroyal.net/ |
| MEDAR GOSTARESH | http://www.itorbit.net/ |
| HAMKARAN SYSTEM | http://www.systemgroup.net |
| RAYDANA SYSTEM | https://www.raydana.com/ |
| SAMAN PARALLEL PROCESSING CO. | https://www.sppcco.com/ |
| TAKROSYSTEM | https://www.takrosystem.ir/ |
| RAYVARZ | https://rayvarz.com/ |
| FARAGOSTAR | https://www.faragostar.net/ |
| PARNIAN PARDAZESH PARS | http://www.parnianportal.com |
| BARID SAMANEYE NOVIN | https://www.baridsoft.ir/ |

The case study can focus on a single case or a single organization (Easterby-Smith et al. 2008), and a case study such as that pursued here allows a large variety of evidence to be reviewed, such as documents, interview material, and observations. Structured in-depth interviews were conducted with the CEO of Behko and one employee, and three employees at EBC. Three important strengths of such qualitative research were highlighted by Silverman (2005) as (1) It takes account of the local context; (2) It provides a complex and rich understanding; and (3) It happens over a period of time, which also allows for an understanding of causality and history. Yin (2012) also notes that a case study can be viewed as "an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident" (p.48).

The research questions noted above were used to generate different sets of sub-questions for the one-to-one interviews. An interpretivist paradigm was adopted to understand what happened in these two companies before and during the ERP implementation process, developing ideas and concepts through induction from this interview data, and relevant perspectives derived from the existing literature were incorporated into the analysis of findings. As Gray (2009) states, pre-existing theories or ideas are beneficial when approaching a problem. A qualitative methodology was chosen to explore and understand participant perspectives as shaped through their experiences and respective business roles and views (Creswell, 2009).

The interviews were recorded, transcribed and analysed to identify key issues. For the analysis of such data, Miles and Huberman (2009) outlined a simple "data display and analysis" approach which was adopted here. Saunders et al. (2009) noted that this approach "is suited to an inductive strategy to analyse qualitative data" (p. 505). This allowed the development of appropriate responses to the research questions. As Miles and Huberman (2009) note, "as part of data analysis, data display is designed to assemble organized information into an immediately accessible, compact form (e.g., types of matrices, graphs or charts) so that the analyst can see what is happening" (p.11). The evidence from the one-to-one interviews was analysed in two phases. First, the replies to each of the sub-questions were summarised and some specific, distinct responses were identified. Then these responses were organised and oriented around the main research questions and synthesised in a table that summarized the findings for each research question. This allowed the identification of key statements and attitudes regarding the Behko company, its products and services, and the conduct of the ERP project at EBC.

Participant observation and review of existing documents and online sources contributed to the interpretation of events. A summary of findings were fed back to all five interviewees for further comment. More recent interviews and phone conversations allowed the authors to develop their understanding of the functioning of the Behko company and how the ERP project at EBC was progressed. As Walsham (1995) notes, "it is desirable in interpretive studies to preserve a considerable degree of openness to the field data, and a willingness to modify initial assumptions and theories. This results in an iterative process of data collection and analysis, with initial theories being expanded, revised, or abandoned altogether" (p. 76).

## THE BEHKO SOFTWARE HOUSE

### Origins and Evolution

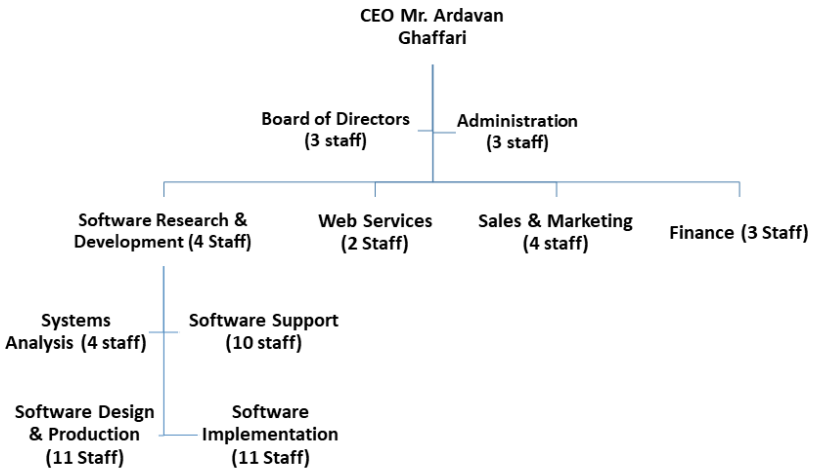
Ardavan Ghaffari, who saw the opportunity of developing a homegrown ERP product for the Iranian market, founded Behko in 2005. Behko was set up as a commercial enterprise with the objective of developing integrated software geared to customer requirements, and thus capable of significant performance improvement, providing a cheaper service than western ERP vendors, as well as creating new jobs in the region. The company's first customer was Hamgam Khodro, a car pressing, design and assembly company. Before implementing the Behko ERP, Hamgam Khodro used an ERP system provided by Logo, one of the largest software companies in Turkey. After three years of unsuccessfully trying to implement the product, Hamgam Khodro decided to abandon the Logo product and implement the Behko ERP. The company was attracted by the integration of the Behko modules, and the company's professional, locally based support capabilities. Behko rapidly built up its customer base and its staff expertise, growing from 15 staff in 2007 to over 50 in 2021 (Figure 1). Most of the staff working in the software and systems departments have BA and MSc qualifications in computing or industrial engineering. Many of the support staff also have a BA qualification, typically in industrial engineering, and there is also significant experience and expertise in the commercial and accounting areas. The main office is located in Esfahan, with subsidiary customer support and sales offices in Tehran and Yazd.

Behko's main competitors are the Iranian companies Hamkaran and Rayvarz, and the leading international ERP vendors, notably Microsoft, Oracle and SAP. Behko products are sold directly to their customers; pricing varies according to the number of modules and customer requirements for customization, but they generally undercut the large international vendors. Behko itself is now planning to sell internationally as well, once its new web-enabled, Cloud-based product, is available. Behko is keen to increase its market share and expand its geographical spread of customers. However, most of Behko's national competitors are also developing web-based solutions, but the Behko CEO believes that western products do not constitute a major threat, now that the Behko product is proven in the Iranian market, and remains price competitive. Behko software is generally much cheaper in terms of license and implementation costs, and the western ERPs are likely to be chosen only by large organizations who can meet the financial and resource requirements. Some of the western products, because of the sanctions, have been supported by third parties outside Iran, and this may be seen as an unnecessary support overhead and security risk.

### The Behko ERP Product and Services

The initial Behko ERP product was designed and developed in 2005 by a consulting and production team commissioned by the company owner and CEO. Behko ERP runs under the Windows operating system, but can also be accessed through the web by using virtualization technology. However, at present, there is no fully web-based version available, although this is in development. The product was designed to be customizable, so that it could be adapted to, and used by, different industrial sectors. The system architecture has three layers: database, business logic and user interface. The

**Figure 1.** *The Behko company organisation chart 2021*




main technology component of the product is .Net, and the system was developed in C++, using the SQL database. These are all modern technologies that provide a sound strategic platform for future development of the product.

Since 2005, Behko has released three versions of the ERP product. The package evolved module by module, with approximately 70% of the functionality being core design and 30% customizable according to customer requirements. The Behko ERP product can be used selectively to integrate with other modules of pre-existing software packages. For example, in HESA (an Iranian aircraft manufacturer), certain modules of the Behko ERP were implemented to initially integrate with another pre-existing system (the Hamkaran software package), which was subsequently replaced, stage by stage, by corresponding Behko modules. Behko offers options in terms of the implementation process – ranging from a one-off implementation of the full package ("big bang") to a phased implementation that may include all or just some of the product modules. Behko is currently designing its new web-enabled ERP product, offering increased support and maintenance services. The company will soon have available both web and Windows based versions of the ERP product for sale in both the domestic and international markets.

Behko offers pre- and post-sales support for customers through a variety of communication channels - phone, internet "live chat", email, newsletter and their training center. Behko provides training to support the implementation phases of projects, and provides consulting for process re-engineering and performance management. The company also has an online system that allows customers to communicate with Behko sales or support staff to resolve technical issues or get advice regarding the software. Via the customer portal, "tickets" are issued, each with a specific reference number. Based on the information provided on the ticket, the system will guide the customer to appropriate documentation or an appropriate support person. The Behko support team can advise the customer or use the remote connection service to connect to the customer computer server to resolve the issue. When issues are resolved, the customer will receive an email to rate and register their satisfaction level. This is helping Behko to monitor and review the reports on a daily basis, identify and analyse trends, review customer satisfaction levels and deal with complaints. This data is consolidated and analysed to assess whether the company is meeting its service level targets.

## A CUSTOMER PERSPECTIVE: THE ESFAHAN BUS COMPANY (EBC)

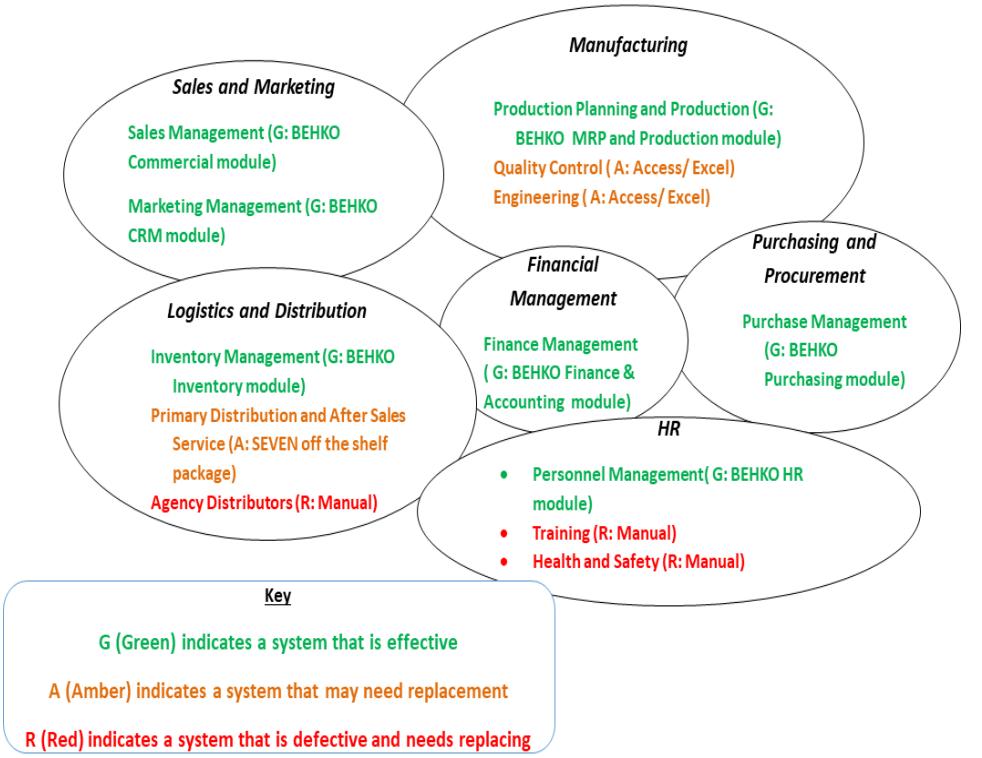
The initial implementation of the Behko ERP system at EBC was in the period 2008 – 2011, but upgrades and process improvements have been on-going since then, as is the case with most ERP products. Implementing an ERP product is not a "one-off", but rather a continuous process of making the best use of systems functionality and accompanying process improvement. EBC was founded in 1985 as a family business in Najafabad in Esfahan province, and designs, manufactures and sells a range of buses, vans and spare parts, currently employing 350 staff. A detailed structured questionnaire was filled in by three employees at the company, and follow-up interviews were conducted with the questionnaire respondents. The job roles of these respondents were IT manager, engineering manager, and commercial manager.

The EBC decision to implement the Behko ERP in 2008 was taken by a cross-company committee, comprising managers from all departments - commercial, finance, production, engineering, quality control, plus the IT manager. The key objective was to support the company's broader business strategy of expanding production and driving up bottom-line profit. The selection of the Behko product was based on functionality, language (it uses both Parsi and English), and easy access to systems support and product upgrade services. EBC's pre-existing systems were a mix of off-the-shelf packages and end-user applications. The initial focus was in logistics and distribution, to establish consistent inventory product codes, simplify and standardise product information for both internal processes, and also for customer-facing sales and marketing departments. Modules of the Behko ERP system were then implemented in the other core process areas of the business, with some customization to meet the specific requirements of the company (Figure 2). Not all pre-existing systems were replaced, and some interfaces between old and new software had to be built. The installation of the system was based on a phased implementation, to allow staff to adapt to the changes in systems and procedures in an orderly and controlled manner, to facilitate a careful phasing out of some of the pre-existing systems, and to provide a carefully managed exchange of data between old and new systems.

It took three years to implement the system in the first instance, and system upgrades and extended usage have continued, but even now some sub-processes are still manual or are supported by using spreadsheets and semi-automated file exchanges. For example, although the Behko system modules are well integrated, there is no effective integration with the stand alone "Seven" system (for distibution and post-sales tracking), nor with some of the MS Excel and MS Access applications. Senior managers have access to all system generated reports and invoices. These reports include key business performance information, providing an overview of all sales, purchases, stock levels, and financial data and staff reports. The company has two Microsoft SQL database servers. The Behko software runs on one server, and database backup and vital files archiving are done on the other server every day. There are 100 desktop computers, which are available to 100 or more users. EBC has also provided twenty portable devices (mainly laptop computers) to accommodate staff members for off-site working, or presentations and meetings. All PCs now run under the Windows 10 operating system and have MS Office available. EBC uses a private VLAN and Cisco switch for higher security and privacy. The company uses firewall network security, located in three different physical areas, to prevent unauthorised access from other networks.

The cross-departmental steering group which had selected the Behko product was also instrumental in managing the phased implementation, facilitating the provision of necessary training and support for end-users. Behko provided project managers who worked closely with EBC's IT manager and his team. A combination of internal managers, who knew the business, and external managers who were expert in ERP, positively affected project outcomes in a number of ways. Involving users and sharing the goals and objectives developed a shared perspective with management, and fully engaged them in the ERP project.

**Figure 2. Information systems at the Esfahan Bus Company 2021**




## FINDINGS SUMMARY

The three research questions noted above are addressed below. These findings come with certain qualifications. This is essentially a case study of one software house and one of its customers, and the methodological decision to rely in the main on semi-structured interviews comes at the cost of limited representation, as compared to quantitative surveys, for example. In addition, the national and cultural setting of the empirical research locations at Behko and EBC means that results are potentially biased because of local culture or regional traditions.

RQ1: What were the origins of the Behko software house and how has it evolved in recent years?

The Behko software company was founded in 2005 to provide integrated software solutions for customers seeking a cheaper option than the products offered by western ERP vendors, as well as creating new jobs in the region. The Behko software has, in the main, been implemented by manufacturing SMEs in the Esfahan region, such as Hamgam Khodro, Pishrodiesel Asia, and EBC. The company has grown its staff threefold since 2005, which has facilitated the development of new systems functionality and the incorporation of new technologies into the core product. This has allowed the company and its products to remain competitive and the company has steadily increased its revenues, although specific figures on revenue growth are not available.

RQ2: What are the main characteristics of the Behko ERP product and what support services are available?

The Behko ERP product comprises thirty modules oriented around six main business processes, designed according to perceived best practice, using international standards such as the Process Classification Frameworks and the American Productivity & Quality Center. The ERP software is based on a three-tier architecture operating under Microsoft Windows, but can now also be run via a web-based interface. User companies are able to define multiple workflows for each process area, depending on departmental requirements and access. The product also supports multi-branch companies and could be used by international operators. The company provides a full after sales service, providing training and an online problem resolution help facility.

RQ3: How has the product been implemented and what lessons can be learnt about the implementation process?

Behko has now implemented its ERP product in more than twenty user companies in Iran, including Borna Battery, Asia Khodro, Rasoul Mashine, Sepahan Khodro, Hamgam Khodro and EBC. Its project support team adhere to the principles of the project management life cycle (Ghaffary, 2018), and suggest a phased implementation process, encompassing process preparation, planning, implementation, monitoring, quality control and project termination. In practice, implementations are rarely that straightforward, and the case study at EBC illustrates how the product can be adapted to a phased introduction of software modules that may involve the building of interfaces to pre-existing software. It also underlines the significance of process improvement and people skills enhancement, in underpinning successful new technology deployment.

## CONCLUSION

In conclusion, this study points to the growing significance of the home-gown ERP products and companies, such as Behko, in the overall information systems landscape in Iran. The evolution of the Behko company illustrates how Iranian companies have designed, developed and implemented ERP products that can compete alongside those offered by western-based companies. The future will pose new challenges, however, as new technologies evolve and are embedded in mainstream ERP systems. For example, Behko does not yet have a fully supported SaaS version for its product via the Cloud, and this may be seen as a possible opportunity for western-based ERP providers, as and when the political situation allows them unfettered access to the Iranian market.

This study clearly has its limitations, in that it is an analysis of one software provider in a developing country with particular market conditions. The authors nevertheless believe it will be of interest to both researchers and practitioners in this field as there are few documented examples of ERP projects in which home-grown products are implemented. Future research could examine possible parallels in other developing countries. Dixit and Prakash (2011), for example, note that "several large companies in India, both in the public and private sectors, have successfully implemented ERP and are reaping the benefits" (p.4), and that "ERP vendors like SAP, Oracle, Microsoft, QAD etc. are all trying to increase their customer base in the SME segment and have products specifically designed to cater to the needs of SMEs" (p.5). However, Dixit (2021) lists and details a range of free and open source ERP products available in India (for example, EasyERP, ERPNext, Axelor ERP and WP ERP), but little is known at present about their penetration in the Indian or other developing world markets. The impact of the Cloud on ERP operation and customer choice is another area worthy of further research in a developing world context. As ERP software supplier Epicor (2014) notes "smaller companies implementing their first ERP system will find subscription SaaS the most cost

effective way to deploy a world-class ERP solution. Larger companies that are expanding operations world-wide can use Cloud ERP to replicate business processes consistently around the globe" (p.7). However, consistent, reliable and adequately fast access to the internet to support Cloud solutions is still an issue in many developing countries, and this may slow the development and uptake of home-grown Cloud-based ERP products.

This will pose new challenges for Iranian providers like Bekho, but they have inherent advantages in their location aside their main market, and in language and cultural issues. The success of Behko in implementing its product and associated services in a range of SMEs in Iran, and the development of other Iranian based software houses, gives testimony to the capabilities and potential of the home-grown software industry in Iran. The manner in which Behko has adapted its product to the changes in mainstream technology during the recent past suggests it is well able to do so again in the forthcoming decade.

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*Maryam Rezaeian is an IT Support Analyst at University College London. She completed her PhD at the University of Gloucestershire in 2016 focusing on information systems deployment in Iran.*

*Martin Wynn is Associate Professor in Information Technology in the School of Computing and Engineering at the University of Gloucestershire. His research interests include digital transformation, information systems strategy, technology transfer and sustainability.*