

Enterprise Resource Planning And Its Future Relationship To Decision Support System

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ABSTRACT

This paper looks at the development of ERP and DSS, with a focus on the differences between the two systems in terms of their evolution and applications and the potential for convergence in the future. For the most part, ERP and DSS have evolved in parallel, and as a result those organizations, which have already implemented ERP, are now having problems integrating DSS and data warehousing into their system. ERP vendors hold the opinion that it is comparatively simple to add on DDS applications, but this tends to be contradicted by the fact that most ERP specialists are not experienced in DSS or in data warehousing. Software analysts from both sides of the industry agree that convergence is inevitable, but differ in their views as to how this should be achieved. It would seem that a greater degree of collaboration, and the transfer of skills between the two sides, is the most practical option, coupled with a case-by-case approach to the requirements of individual customers rather than trying to find blanket solutions.

BACKGROUND

In order to assess the present applications of Decision Support Systems (DSS) and Enterprise Resource Planning (ERP), and the way in which the two are interrelated, it is useful to briefly consider the evolution and development of the two systems before looking at their current state of convergence. (See Figure 1)

DSS

Decision Support Systems (DSS) is a computer based information system designed to support all phases of semi-structured and unstructured decision making. It is composed of corporate data (data warehouse), a set of analytical models and tools, a knowledge base, and an easy-to-use user interface [9] [7]. The inception of DSS systems can be traced to the 1960s, and the point at which it was becoming viable to develop Management Information Systems in large organizations. The first versions of DSS came about as a result of studies into decision-making in organizations combined with technical research into interactive computer systems. As Powers notes, these early developments were taken up and expanded. Some of the parameters set at the time are still valid in modern DSS systems. Little (1970) set out the four main criteria for designing a system to support organizational decision-making, namely, robust structure, simplicity, ease of control and inclusion of relevant detail – these are all integral to modern versions of DSS [9].

Because of the various branches of research, which were being conducted, and the different approaches being taken, by the late 1970s there were a number of systems, which utilized models and data to facilitate managerial decision-making. These all came under the generic classification of Decision Support Systems and it was acknowledged that DSS could support decision-makers at any level in an organization. DSS could support operation, financial management and strategic decision-making. A variety of models were used in DSS including statistical packages, optimisation and simulation during 1970s, artificial intelligence and expert systems in early 1980s [9]. During early 1990s, data warehousing and decision support technologies began converging. Since 1995, data warehousing (DW) has been at the centre or off the side of DSS [9].

Data warehouse is defined as "a collection of integrated, subject-oriented databases designed to support the DSS function, where each unit of data is non-volatile and relevant to some moment in time." The definition implies that the objective of data warehouse is to support decision functions and it is not limited to operational functions. It also indicates that the data warehouses hold aggregated corporate data for decision-making and analysis [7].

ERP

Enterprise Resource Planning (ERP) is "an industry term for integrated, multi-module application software packages that are designed to serve and support multiple business functions." [8]. The vision of integrating information systems began during 1960's and 1970's, evolving from inventory control system to Material Requirement Planning MRP software and MRPII. The basic concept of Enterprise Resource Planning (ERP) system was inherent in the development of MRPII (1980's) and according to Brady et al; it is possible to view ERP system as extension of MRPII [2].

During 1990's, the need for unifying, coordinating and standardizing the functional units of an entire organization led to the development of Enterprise Resource Planning. Up until 1998, there were a few ERP vendors: BAAN, J. D. Edward, Oracle, Peoplesoft, and SAP, providing ERP software. Their target markets were Fortune 1000 companies. The Small to Medium Enterprises (SME) were preoccupied with Y2K problems, Customer Relationship Management (CRM) and e-commerce, undermining ERP implementation.

In 1998 and 1999, most of the Fortune 1000 companies implemented ERP or had planned to implement it. According to IESE [10] report on Enterprise Resource Planning Survey of US Manufacturing Firms, by year 2000, 44.1% of US companies have implemented ERP, 18.8% were in the process of implementing ERP packages, 10.3% had plan to install ERP and 26.8% did not have plan for ERP implementation. From year 2000 to present, ERP vendors have placed great effort in expanding ERP functionalities by integrating e-commerce, Customer Relationship Management (CRM), Supply Chain Management (SCM), data warehousing, and other Business processes into ERP software. The current ERP software and its related systems (CRM and SCM) include many decision support tools and technologies. [12]

The continued upgrade and incremental functionality to ERP has created a new term ERP II. The term ERP II, first appeared in year 2002 in Gartner research group's remarks that " the rapid evolution of ERP has already lead to a new corporate must have, ERP II, which is supposed to help businesses gain more competitive edge in the future." [5]

DISCUSSION

Sammon et al (2004) look at the early stages of systems development in their analysis of the way in which ERP has developed, pointing out that many organizations have been disappointed in their attempts to implement ERP because of the divergence between the needs of the organization, and the kinds of systems which are being promoted as suitable to fulfil them. The two do not always coincide. Shafiei and Sundaram (2004) note that although ERP and DSS have evolved separately, there is an increasing trend towards integrating the two. ERP and its related systems such as Customer Relationship Management (CRM) and Supply Chain Management (SCM) are utilizing decision support tools and technologies. These technologies include Business Intelligence, Customer Intelligence, Supply Chain Intelligence and Business Analytics. The DSS and data warehousing technology utilize the data maintained in ERP systems. The increasing integration of the two systems is potentially valuable in a number of ways. For example, organizations, which do so, are able to increase their intelligence density, and improve both the quality and the availability of decision support information [12].

Inmon (2000) comments that although it might seem strange that there has been so little integration of DSS and ERP to date, but there are actually valid reasons for this. For instance, ERP has its origins in operational Transaction Processing Systems (TRS), whereas DSS is concerned with decision support and strategic planning-, which are two very different ground works [4]. Another difference in the origin of the two systems is the fact that recent ERP has been created, developed, and marketed as customisable package by application software vendors, while DSS has evolved mostly by information system researcher and database theorists [5]. Both systems are popular

in their own circle and there is room for both as components of a higher level (integrated) system but their respective paths do not cross. The ERP systems are being implemented by many organizations, and it is being realized that such implementation only inputs data; it does not prepare it for analysis or usage beyond what ERP vendors prescribe. In fact, the way that ERP systems are structured actively prevents the organizations' users to access or analyse the data from non-ERP environment; hence, ERP software manufacturers have incorporated data warehousing, from DSS domain, into their products.

Building data warehouse into ERP has not been particularly successful by ERP vendors, since the concepts involved in data warehousing are different to those in operational transaction processing. Those who understand and are experienced in transaction processing are not generally competent in building data warehouses and vice versa [4]. Inmon (2000) foresaw three possible directions for the industry that would attempt to resolve the difficulties surrounding ERP and DSS convergence. He also remarked that all three paths would come about, but with different level of success.

- ERP vendors facilitate incorporating in their ERP data warehouse the data from applications that are outside of the ERP. This path seems to be preferred choice for ERP vendors who have knowledge and understanding of data warehouse. Although some ERP vendors have "enlightened" approach to data warehousing, the fact is that their expertise is in operation and transaction processing not DSS [5]. One critical issue in this option is how to deal with organizations that have ERP implemented in one area and have efficient DSS (data warehouse) in others. It seems unlikely that the organizations would transfer the contents of their data warehouse to ERP's data warehouse where ERP maintains control access. The ERP control over the data warehouse is contrary to the basic objective of DSS, which is to increase the individual organizations' intelligent density and create competitive advantage. The organizations competitive advantage is implanted in their data warehouse. If vendors create and control the data warehouse for an industry, there will be no competitive advantage, because every organization in the same industry will have the same data warehouse and the same DSS [5].
- Two independent data warehouses would be built: one for non-ERP applications and one for ERP applications. This path follows the historical pattern of the two systems evolving independently from each other. The advantage of this path is that it allows free access to the data, at least in non-ERP data warehouse, but does not allow to view an organizational data as an integrated whole. This path is particularly advantageous for organizations that already have an efficient and established DSS. The disadvantage of having two independent data warehouse is that in practice it would not be possible to combine the data from one data warehouse to the data in another data warehouse [4], unless a consolidated view of the data is created at a higher level as enterprise data warehouse.
- A standard organizational data warehouse is built to references the data in both ERP and non-ERP application and there would be no ERP data warehouse. Inmon (2000) notes that there are already a percentage of organizations that have adopted this option. This path allows the organizations to integrate all areas, gives them greater freedom of access and choices with regard to the data warehousing tools and technology which they use, and does not tie the organizational data to the any particular ERP application. This option is a particularly popular option for those companies who have found ERP vendors to be unsatisfactory in their perception of building data warehouse. The non-ERP data warehouse vendors, as a third party, with good record of keeping up with technological changes, can develop a standard organizational data warehouse that accesses the data stored in ERP environment as well as legacy systems. [5]

The emerging convergence of ERP and DSS leads the organizations to take on one of the above paths. The important factors in selecting one of these directions are the organizations current structure, historical development and implementation of ERP and DSS.

While ERP applications offer considerable improvements in the functional areas of operation and reduce the operation expenses, there are major shortcomings in the way that ERP systems handle data analysis [1]. Many

companies today store their data in legacy systems as well as relational databases within ERP, and although ERP systems are satisfactory for transactional operations, they were unsuitable for handling decision support. The growing demand from management of the organizations for more information to deal efficiently with ever growing organizational complexity has further lead to increasing convergence between ERP and DSS.

In the past, ERP vendors were able to hold off any threats from third party DSS vendors by controlling access to ERP data. This situation is changing by the availability of third party DSS vendors and technologies that can read and access ERP data [5]. The solution, which ERP vendors have adopted, is to add data warehousing and DSS to their own systems. But this has not been successful, primarily because the skills required for building effective data warehouses are not the same as skills required for transactional operations. The increasing convergence between ERP and DSS is being driven by: ERP vendors, third part DSS vendors [5], and users who need to become more closely aware of how their ERP vendors are addressing the issues [1].

One of the issues, regarding convergence, is how the ERP vendors are going to incorporate the decision support data requirements in their ERP. If, for example, ERP vendors are going to simply add queries and data analysis tools to access transactional data sources and maintain total control over ERP data warehouse, this not only creates inefficiencies and delay in response time, it is liable to cause problem with the application itself. On the other hand, if the ERP vendors were developing an organizational warehousing strategy that can include entire organizational data: ERP data and non-ERP data, then this would create a workable integrated environment [1]. Even with this environment, the organizations' data is unlikely to be kept solely in the ERP, and any DSS offered by ERP system must have the capability of traditional DSS requirements; robust structure, simplicity, ease of use and access, and inclusion of relevant detail.

Another issue surrounding the convergence is the fact that there is a strong disagreement between those with technical expertise and those who are solely interested in the business aspect of ERP and DSS systems. Many organizations which have existing ERP system are aware that the system does not fulfil all their requirements, but are unsure as how to improve the matters. [3] There is a lack of consensus among the technicians, ERP vendors, and companies' operational managements as to whether ERP is a strategy for whole enterprise replacing DSS functions or a tactic to perform improvement in operational level. The major distinction between ERP and DSS is the fact that they are designed to perform two different tasks at two different level of the organization one strategic and one operation despite the major overlaps [3].

From the vendors' point of view, it is necessary to take into account that very few customers would be "starting from scratch", if they would already have ERP system implemented or in progress. As Computing SA points out, customers were impressed by the increased efficiency of ERP itself, and would not realize in the early stages that the ERP systems would include data warehouse and overlap DSS functionalities. The functional managers were, usually, "too busy" implementing the ERP systems that takes an enormous amount of time, and the decision support analysts were not initially involved in the information requirement analysis [3]. Therefore, the organizations that would find a demand for data warehousing or realize that their existing DSS has difficulties accessing ERP data, would need to build on the existing systems rather than designing from the ground up. In another term, ERP vendors were aware that the organizations implementing ERP systems will have to acquire data warehouse and they anticipated that customers most likely would upgrade ERP rather than trying to install a completely different technology.

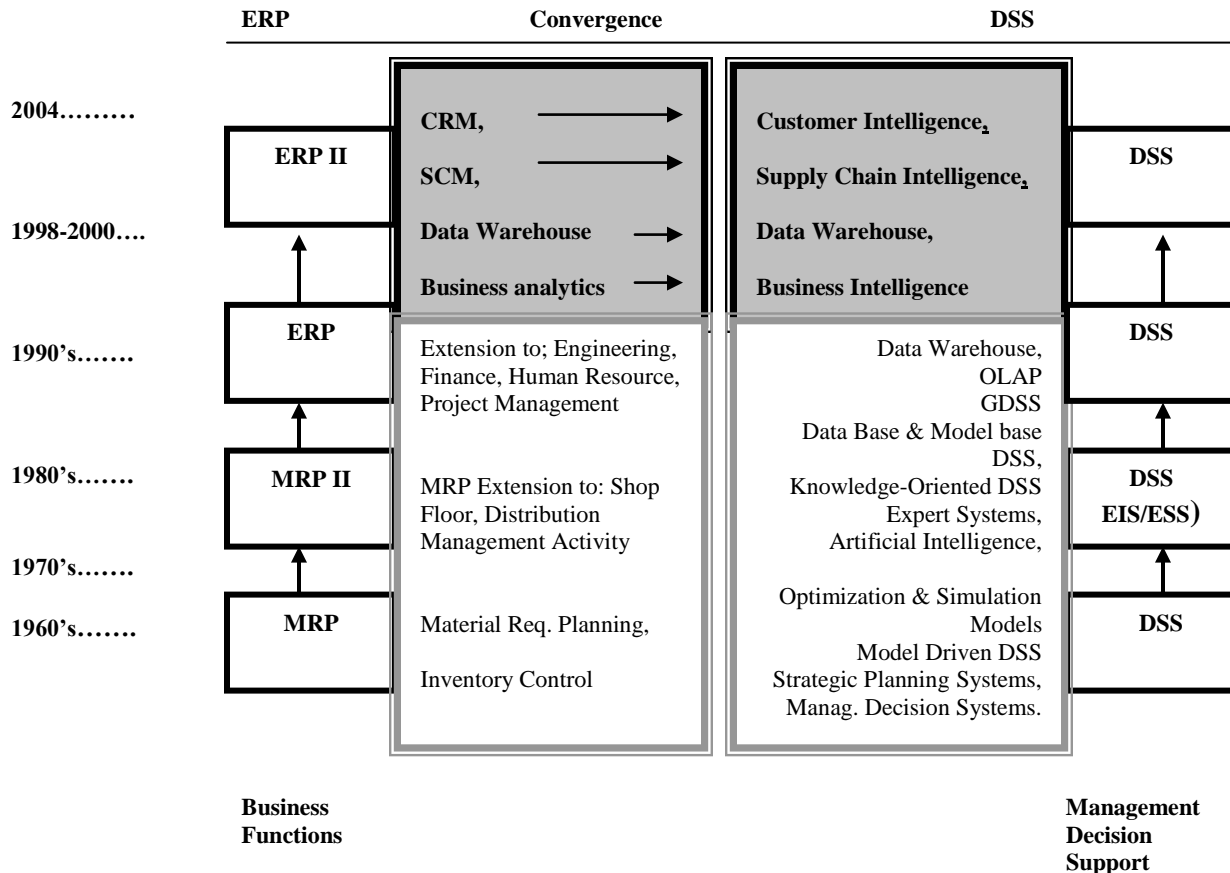
It seems that there are no easy solutions to the problem. It is evident that many ERP vendors are convinced that they can also offer DSS systems, and that their customers therefore do not need to look elsewhere: in practice, however, this does not seem to be a particularly successful option. Nor is it practicable for organizations to do without DSS altogether, since it is evident that ERP alone has too many shortcomings. It would certainly be reasonable to argue that looking for a blanket solution may be doomed to failure in any case and that each organization must consider its individual requirements and vendors work on a case-by-case basis [5]. This would certainly lead to a competitive market between ERP and third party data warehouse vendors, and possibly give the opportunity for customised solutions.

CONCLUSION

Whichever option takes precedence, though, it seems clear that there needs to be a much greater degree of communication between ERP and DSS specialists. The main complaint about ERP vendors involving themselves in data warehousing is, quite simply, that they are not competent at it. Because of the way that the two systems have developed in parallel, any convergence now is going to mean that those who specialize in transactional operation systems are going to have to broaden their field of expertise, and make use of the skills of those who have spent their time developing DSS.

This need not, however, be a one-way transaction. DSS specialists can also learn from those experienced in ERP, and both sides need to look closely at what customers actually want, and acknowledge that customer requirements are likely to change and evolve as organizations grow. As Computing SA points out, a company, which is impressed with the potential of its first ERP application, is unlikely to be looking immediately towards data warehousing and DSS applications, but it would be wise of the ERP vendor to foresee this possibility, and have solutions ready when the time comes. Otherwise, third party vendors who are already getting a prominent foot in the market are likely to be favoured over ERP vendors who can offer nothing more than unsatisfactory front-end bolt-on applications. The future would seem to lie in greater collaboration and cooperation between the developers and manufacturers of both systems: if convergence is inevitable, then there is little to be gained from them continuing along the lines of parallel evolution, especially as such a path is unlikely to fulfil customer requirements adequately.

Figure 1
ERP And DSS Convergence



REFERENCES

1. Bonadio, Steve, Closing the Loop, Retrieved 20 Mar 2004 from: http://www.iemagazine.com/db_area/1998/9810/newsjhtml.
2. Brady, J. A., Monk, E., F., and Wagner, B. J., *Concept in Enterprise Resource Planning*, Canada: Course Technology, 2001.
3. Computing SA., Convergence of strategy: the key to success, Retrieved 17 Mar 2004 from: <http://www.sas.com/offices/africa/southafrica/news/1999/032999.html>.
4. Inmon, B., Information Management: Charting the Course: ERP and the Data Warehouse: Reading Tea Leaves, Retrieved 17 Mar 2004 from: <http://216.239.59.104/search?q=cache:Q2o5693CeGoJ:www.dmreview.com/master.cfm%3FNavID%3D198%26EdID%3D2562+%2BERP+%2BDSS+%2Bconvergence+%2Badvantages&hl=en&ie=UTF-8>.
5. Inmon, W. H., ERP and the Data Warehouse: Forces of the Next Decade, Retrieved 17 Mar 2004 from: <http://www.bijonline.com/Article.asp?ArticleID=220&DepartmentId=6>.
6. Little, J. D. C., (1970) Models and Managers: The Concept of a Decision Calculus, *Management Science* 16:8, B466-485.
7. Marakas, George, *Decision Support Systems*. Prentice Hall, 2nd Edition, 2003.
8. No Author, ERP Overview, from: http://erp.ittoolbox.com/pub/erp_overviea.htm.
9. Power, D. J., A Brief History of Decision Support Systems Retrieved 17 Mar 2004 from: <http://dssresources.com/history/dsshistory.html>.
10. Rafael, A. and Valor, J., Introduction to ERP, Retrieved 19 Feb 2004 from: <http://webprofessor.IESE.edu/valor/Docs/EMBA/Intro%20ERPs.pdf>.
11. Sammon, D. et al, (2004) Benefit Realisation Through ERP: The Re-Emergence of Data Warehousing, Retrieved 17 Mar 2004 from: <http://www.ejise.com/volume6-issue2/issue2-art17-sammon.pdf>.
12. Shafiei, F. and Sundaram, D., Multi-Enterprise Collaborative Enterprise Resource Planning and Decision Support Systems, Retrieved 17 Mar 2004 from: <http://csdl.computer.org/comp/proceedings/hicss/2004/2056/08/205680228a.pdf>.