

Effectiveness and impact determination for Enterprise Resources Planning Systems: A case for manufacturing entities in Zimbabwe

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Abstract

The research looked at utilization and impact of Enterprise Resource Planning (ERP) systems for manufacturing organizations in Zimbabwe. Existing literature on adoption of Enterprise Resource Planning systems, its utilization and benefits realized was reviewed. A survey of eighteen Zimbabwean manufacturing organizations was conducted to establish the utilization of Enterprise Resource Planning systems. The survey centered on operational, strategic, managerial, and Organizational functions and their interaction with the Enterprise Resource Planning systems. The strategic, managerial, and Organizational functions, results reflected positive feedback on the system usage. Operational functions had mixed responses with an overall of 58% being positive and 42% negative. Various impact dimensions were determined and mechanisms of effectiveness in the application of ERP systems established. The research went on to develop a tool using C-Sharp that organizations can use to determine their level of Enterprise Resource Planning system utilization and gave recommendations on how organizations can improve on their Enterprise Resource Planning system utilization for competitive advantage.

Key Words: Enterprise Resource Planning, Operational, Managerial, Strategic, Organizational, Effectiveness, Benefits

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1. INTRODUCTION

An Enterprise Resources Planning (ERP) system is a strategic tool, which synchronizes, integrates, and streamlines data and processes of an organisation into one single system to gain a competitive edge in uncertain business environments (Madanhire & Mbohwa, 2016). Assertions by Robey, Jeanne, and Boudreau, (2002) posit that successfully implemented ERP systems assist organizations with data integrity, reduce operational costs, improve customer service, increase productivity, and inventory management. Adopting and implementing an ERP system is a huge investment, and there is a possibility of risk to the organisation (Davenport, 1998). Currently, the success of most ERP systems is measured by the number of user complaints. However, it may be argued that there is no benefit or there is marginal benefit realized from the implementation of the ERP system (Murphy & Simon, 2002). Organizations implement ERP systems being promised impressive strategic, operational, and information-related benefits (Trott &

Hoecht, 2004), but are the organizations realizing any benefits from previous business processing. The study seeks to assess if ERP system implementations are being beneficial and their effect on value addition to the organisation. There has been increased studies on factors affecting the successful implementation of an ERP system considering time and budget mainly (Panorama, 2013). However, even after completing the ERP system implementation within budget and on time, Panorama (2013) highlights that 60% of ERP system users are not satisfied by the business benefits delivered by the system. This study sought to establish if manufacturing users, in Zimbabwe, are realizing anticipated benefits, if the ERP systems have a positive impact to the business, or otherwise it has come as another drudgery for the organisation. A quantitative strategy based on the Priori Model and the works of Shang and Seddon (2000) was utilized. A multi-dimensional approach - which included a survey conducted on manufacturing organizations which are

currently utilizing the ERP systems in Zimbabwe, review of literature on the ERP system application and use of survey questionnaire to gather primary information – was utilized. The aim of the research was to assess the impact of Enterprise Resource Planning systems for manufacturing organizations in Zimbabwe.

2. LITERATURE REVIEW

According to Amid & Kohansal (2014), an ERP system can be defined as the state-of-the-art information system which can enhance the functions of an organisation and improve the business process. Markus & Tanis (2000) explained ERP systems as entities that integrate inventory data with financial, sales, project management, production control, logistics and human resources data. This assists organizations to price their products, produce financial statements, and manage the resources of people, materials, and money (McKendrick, 2012). ERP systems are further described by Imtihan, Ngadiman, & Haron (2008), as business application software used to manage, integrate, and share information across an organisation, inclusive of subsidiaries in different geographical locations (Madanhire & Mbohwa, 2016). Adjudging context, from the definitions and discussions of earlier research stated, it can be summarized that ERP systems provide organizations with a holistic transparent view of their processes and the entire supply chain. It enables organizations to integrate information from various independent business processes into a single interactive system, on one database platform. This enables them to make transparent, quick, and informed decisions, thereby aiding organizations to gain competitive advantage through operational performance over competitors. Figure 1 illustrates the configuration and functionality arrangement of an ERP system as illustrated by Genoulaz and Millet (2006). Research shows that organizations adopt ERP systems for different purposes. Loh, Koh, and Simpson (2006) in concurrence with Msipa et al (2014) contented that organizations adopt ERP systems to reduce costs, reduce operations time, move towards a

lean organisation, develop strategic alliances, information integration, better information quality, and increase in customer satisfaction. Thus, organizations look at ERP systems, as an enabling instrument for operations in a global competitive environment.

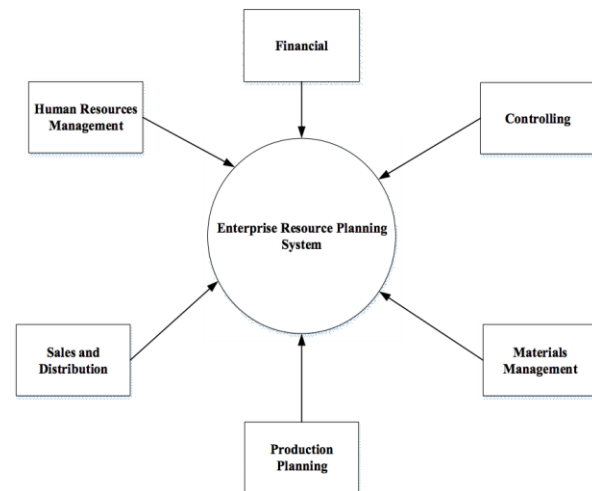


Figure 1. ERP definition (Genoulaz & Millet, 2006:203)

Smadi (2016) goes on to argue that, due to increasing competition in the marketplace, an organisation needs to strategies a winning formula - enabled by providing high quality goods with a favourable price - in the customer requested forms and at the right time, exceeding customers' expectations. This right balance can be achieved with enablers such as ERP systems (Loh, Koh, and Simpson, 2006). This explains the move by organizations towards adoption of ERP systems. Some factors highlighted by Seethamraju & Seethamraju (2008), as the reasons to adopt ERP systems, include problems of interfaced legacy information systems, redundancy in data capture, need for flexibility in business processes, information management and lack of information visibility across the enterprise. Information management and visibility are critical to run an enterprise successfully, and there is imperative need for organizations to advance in their capability to generate and communicate timely and accurate information. (Umble, Haft & Umble, 2003).

The other reasons for ERP system adoption, noted by Grabski, Leech, and Schmidt (2011), include improvement in decision-making as a non-quantifiable benefit and use of it in restructuring the organisation, streamlining their businesses processes and a shift from manual system to automatic information management, through real-time information sharing (Fawcett et al, 2011). A multitude of organizations are investing heavily to achieve the various stated reasons (Monczka, Handfield, Giunipero, & Patterson, 2008), investing in time and resources (El-Mashaleh et al, 2016). Hence the need to ascertain and be able to evaluate realizable benefits apart from the obvious gained functionality of business integration.

In Zimbabwe, according to a report by the Confederation of Zimbabwean Industries (CZI) (2018), there are positive signs of growth in the manufacturing sector and increased investments have been noticed as of 2018. The report further states that, there has been an increase in competition among local manufacturers aided by the impact of import substitution measures. The increase and expansion of manufacturing activities requires organizations to have control over their operations and business decisions. Organizations in Zimbabwe have adopted the use of ERP systems for operations control. Some of the ERP systems in use include SAP, Microsoft Dynamics 365 Business Central, Sage Evolution, Sage ERP X3, Syspro, Aritmos, Oracle, among others (Kambarami, Mhlanga, & Chikowore (2012); Msipa et al (2014).

Kang, Park, & Yan, (2008), mention that strategic business goals and ERP system objectives must be aligned to generate business benefit. They also highlight that the size of the ERP system and corresponding number of implemented modules might also influence benefit realization from the ERP system. Loh et al

(2006) highlight project activities such as user acceptance testing, accurate planning, scope, good communication management and project stakeholders as important factors that will result in a positive or negative effect on operations after the ERP system implementation.

Organizational culture has been cited by Ke & Wei (2008) as being related to learning, participative decision-making, power sharing, support, and collaboration, and goes on to illustrate how this is enabled by top management contributing to a successful implementation. Studies carried out in Zimbabwean industries, by Msipa et al (2014), for organizations using various ERP systems indicate that, for ERP system implementations carried out, 65% of set objectives have been achieved, a 39% sales increase from the ERP systems implementations, 58% productivity improvements. Wong & Tein (2003), conducted a literature review study involving seventeen papers which discussed ERP systems implementation and developed a list of critical success factors (CSF) which are as presented in Table 1, an extract from reviewed sources such as Wong & Tein, (2003).

An analysis of the CSFs in Table 1 indicates that the most prevalent CSFs, found in the literature reviewed, were, Top management commitment and support; Business process reengineering; Use of project management to manage implementation; Change management culture & program; Clear goals focus and scope (business plan and vision); Selecting the right team (competence) and Avoidance customization (Wong & Tein, 2003).

Table 1. Enterprise Resources Planning System Implementation Critical Success Factors

Critical Success Factor	Frequency of occurrence in reviewed literature
Top management commitment and support	14
Business process reengineering	14
Use of project management to manage implementation	13
Change management culture & program	13
Clear goals, focus and scope (business plan and vision)	11
Selecting the right team (competence)	10
Avoidance customisation	10
Project champion	9
User training and education	9
Effective communication	9
Use of ERP's consultants	8
Vendor package selection	6
User participation	5
Technical and business knowledge	5
Integration of the system	5
Appropriate management expectation	4
Appropriate business & IT legacy systems	3
Software development, testing & troubleshooting	3
Vendor partnership	3
Use of vendors' development tools	3
Monitoring & evaluation of performance	2
Management structure	2
Interdepartmental cooperation and communication	2

3. METHODOLOGY

The research was a survey based on Zimbabwean manufacturing organizations currently using the ERP system. The research strategy used was quantitative, based on the Piori Model and the works of Shang and Seddon (2000). The research was in three phases which included determining performance metrics of a successful ERP system implementation, conducting a questionnaire based survey of manufacturing organizations utilizing an ERP system in Zimbabwe and establishing the ERP system realized benefits - by the different ERP system module users - to contribute to the definition of ERP system success. The survey, total sample size was eighteen of the manufacturing organizations, followed a framework covering the strategic, managerial, organizational, and operational functions. The operational functions focused on inventory and manufacturing activities.

The sample population included manufacturing organizations that have

been using an ERP system for at least eighteen months in Zimbabwe. Organizations were conveniently sampled, from listings provided by ERP system distributors in Zimbabwe. From the listings provided, organizations with a manufacturing concern were randomly sampled and selected for engagement. The target population within the organizations was ERP system users from the Production, Inventory, and Quality Control departments. Additionally, one representative was selected from senior management i.e., General Managers, Managing Directors, Operations Managers, or their representatives. The data was analyzed using Microsoft's Excel descriptive statistics tool. Each organization had two respondents i.e., one for operations and one to cover the strategic, managerial, and organizational aspects of the questionnaires. The respondents selected were those who used the ERP system adopted by the organization.

4. RESULTS AND DISCUSSIONS

The ensuing material present the survey results in detail. Table 2 show the demographic profile of participants, by their number of years of using the ERP system, within the organization. Eighteen organizations, out of thirty eight sampled,

responded with representatives from production and management functions participating in the survey. Participants were conveniently selected from middle to top level management.

Table 2 Demographic profile of respondents

No of years using ERP	Inventory & Manufacturing	Management
1-3yrs	2	3
3-5yrs	7	5
5-10yrs	7	7
10+ years	2	3
Total Participants	18	18

The results presented in Figure 3 shows the ERP systems in use by responding organizations. The study targeted different ERP systems used by manufacturing organizations in Zimbabwe to get a reasonable projection extent on the utilization of ERP systems. ERP systems - used by participants -included Sage Pastel, SAP, Sage 1000, Sage Evolution, Xperdyte, Sage ERP X3, and Microsoft

Dynamics 365 Business Central. This ensured results were not biased to the flaws of any ERP system. According to the survey results, of the responding organizations, Xperdyte and Sage Evolution dominate the ERP systems in use, at 22% presence rate each, whilst Sage Pastel was the least applied with a 6% prevalence rate of the responding sampled companies

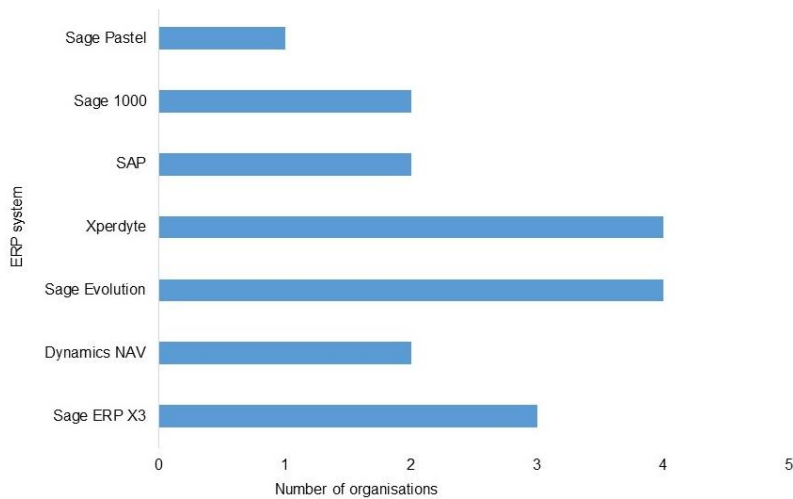


Figure 3 ERP systems used by responding organizations

The types of respondent manufacturing organizations, which participated in the survey, are shown in the results presentation in Figure 4. The sampled organizations were in the production of the following products: construction materials, food, packaging material, and others (encompassing tobacco, chemicals,

fashion, power generation and printing). More responding organizations were in the production of construction materials and others each picking at 33 % respectively. Whilst the balance of 34% was distributed, respectively, between Food and Packaging materials.

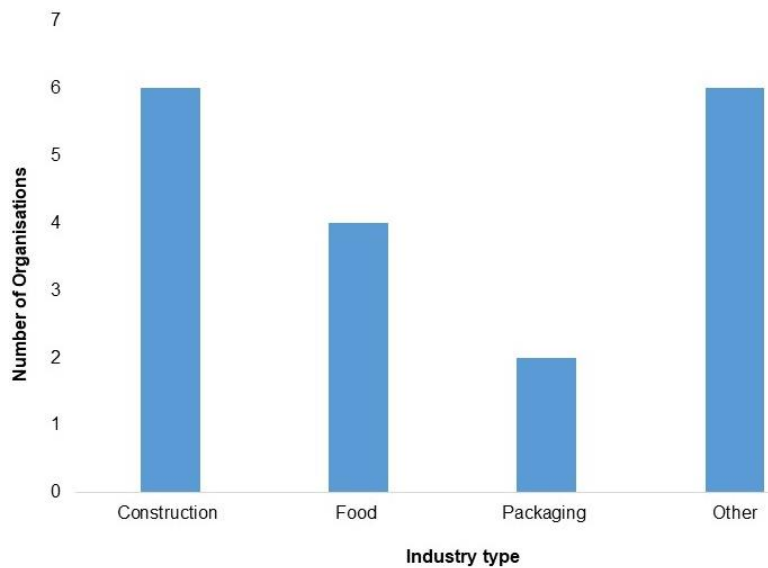


Figure 4 Distribution by type of organizations

4.1 Replenishments Planning

Regarding the utilization of ERP systems in operations, the survey questionnaire focused on inventory and manufacturing operations. It centered on procurement, planning, and production activities within the organizations. The respondents were asked questions on utilization of functions in their ERP system as well as their

perception or experience with the ERP system in question. The results are presented in Table 3. One of the functional areas surveyed relate to procurement. In this respect, according to the results, all participants indicated that they process raw material purchases using the ERP system. However, 45% of respondents indicated that they do not integrate the raw

material procurement to an ERP system budget function. The budgets are done manually outside the system. Expenditure is checked outside the ERP system using Microsoft Excel files. The ERP systems do have budget functionalities, however there was indication there was no control to the expenditure using the ERP system. Budgets could, however, be incorporated in the ERP system for cost control as they assure that an organization's resources and operations are focused on attaining established objectives and goals (Obara, 2014). The system can flag when there is a budget overrun and organizations are able to rectify and manage costs of operations.

Regarding the reduction in purchase cycle time, 55% of organizations indicated a reduction in the purchase cycle time with a mean score of 2.34. 45% of respondents indicated an increase in the purchasing cycle time highlighting long lead times by the organizations in approving requisitions and purchase orders. Due to global competition, it is imperative the supply chain of an organization performs well. Awad & Nassar (2010) highlights that the success of an organization can be obtained by integrating technologies with processes across enterprises and along an organization's supply chain activities. Figure 5 presents, in graphical form, deductions for inventory operations.

Table 3 Inventory and manufacturing functions utilization

ERP system function	Y/N	%	Sum	SD	Mean	Variance
Raw material procurement from the ERP system	Yes	100	18	2.89	4.5	8.33
	No	0	0	0	0	0
Budgets included in procurement cycle	Yes	55	10	0.71	2	0.5
	No	45	8	2.89	2.67	8.33
Reduction in Purchase Cycle	Yes	55	10	2.5	2.34	5.67
	No	45	8	2	0.82	0.67
Planning for stock outs	Yes	83	15	3.75	2.06	4.25
	No	17	3	0.75	0.96	0.92
Cases of understocking	Yes	78	14	3.5	2.38	5.67
	No	22	4	1	0.82	0.67
Production forecasts being done in the system	Yes	45	8	2	1.83	3.333
	No	55	10	2.5	1.29	1.66
MRP / MPS being done in ERP system	Yes	50	9	2.25	0.96	0.92
	No	50	9	2.25	2.06	4.25
Production Scheduling	Yes	67	12	3	1.83	3.33
	No	33	6	1.5	1.29	1.67
Production Costs by batch	Yes	83	15	3.75	1.03	4.25
	No	17	3	0.75	0.478	0.92
Scrap reporting	Yes	83	15	3.75	2.06	4.25
	No	17	3	1.5	0.7	0.5
Quality Control	Yes	22	4	1	0.82	0.67
	No	78	14	3.5	2.38	5.67
Production related calculations outside the system	Yes	50	9	2.25	2.06	4.25
	No	50	9	2.25	0.96	0.92
Product development	Yes	33	6	1.5	1.29	1.67
	No	67	12	2.75	1.5	2.25

Figure 5 presents, in graphical form, deductions for inventory operations.

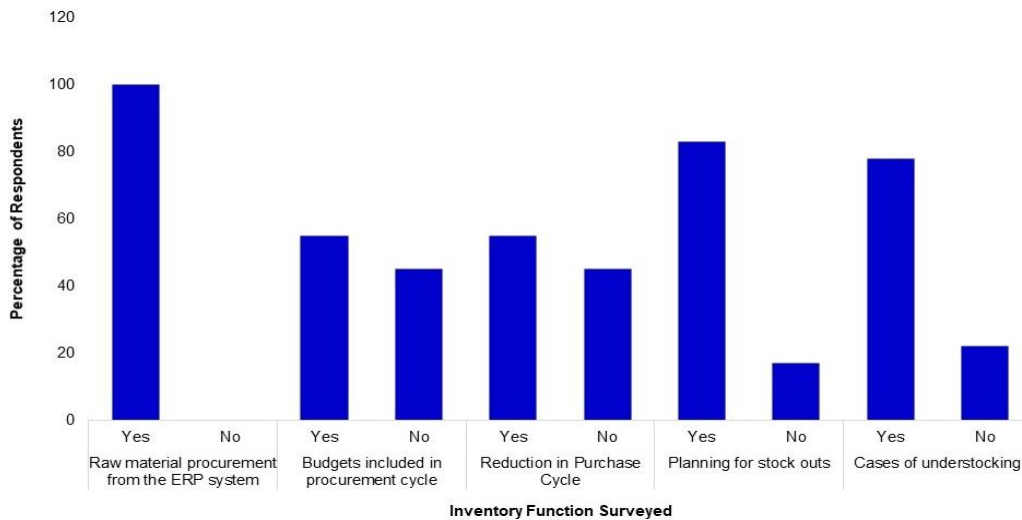


Figure 5 Inventory utilization survey results

Eighty three percent of organizations indicated that they do plan for stock outs by tracking their stock levels and planning for replenishments. However, the results also show that even with the stock replenishments planning done, 78% of respondents still face problems with stock shortages when required for production (mean of 2.38). This has mainly been attributed by the organizations to shortage of foreign exchange currency thereby delaying shipments. Stock imbalances have also been attributed by Yasin, Small, and Wafa (2003), to inaccurate forecasts as being obstacles to stock deliveries from supplier

or to customers. Eswaramoorthi, Kathiresan, and Mohanram (2011) attributed to the fluctuations in market demand. Tracking of stock performance and having visibility of the supply chain improves operational efficiency, prevents stockouts and increases delivery performance (Mora-Monge, Caridi, Crippa, Perego, Sianesi, and Tumino, 2010). Results presented in Figure 6 summarize the findings from manufacturing functions surveyed. Findings presented in Figure 6 are explained in the following section for each manufacturing function surveyed.

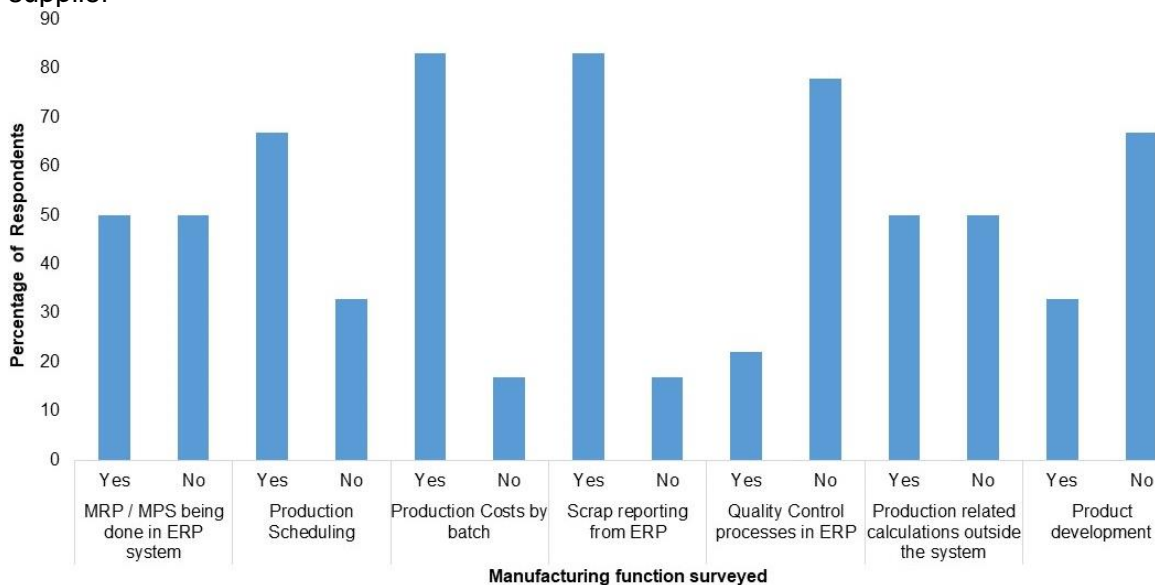


Figure 6. Manufacturing utilization survey results

Regarding the manufacturing areas surveyed, 50% of the respondents

indicated that they were not running Master Production Scheduling (MPS) and

Material Requirements Planning (MRP) functions from the ERP system (mean score of 2.06). Further indicating, rather, that they perform these outside of the ERP system. MRP and MPS have problems that have been cited in Sapry et al (2018) which include: misalignment between forecasted demand and real time market performance which may lead to stock outs or high stock holding; small changes in the final product which could cause great changes to the lower level items planning; limited trend analysis, and need for manual intervention to prioritise work orders as MRP considers work orders for stock replenishment, regular customer demand and past due demand as equal. 5.6% of the organizations indicated that the functionality was not part of the system and would like it added as part of their ERP system. Whilst an equal number of organizations cited that they had a make-to-order policy, and hence, could not forecast on custom made products. Rather, they plan for common base raw materials across products but do not run MPS for finished products. MPS and MRP must be regularly run and revised to ensure products that undergo manufacturing are still on demand and meet the required due dates.

As regards production costs by batch, 83% of the respondents indicated that they were able to get production costs for each batch run (mean score 1.03). They were able to split and identify different cost elements and their cost recoveries for production reporting. 17% respondents indicated that they were not able to track the different cost elements for each batch and would combine these into one single production cost element. Mulyadi (2007) states that, there is need to monitor the actualization of production costs incurred during a production run. This also enables to track and control production recoveries against what is expensed for them. 83% of the respondents indicated that they were tracking waste and measuring production efficiencies through variance analysis, of the different production batches, whereas 17% of the organizations indicated a difficulty to track on production variances.

In terms of quality control, 78% of the respondents indicated they are not printing system generated quality certificates to accompany products to the customers or recipients (mean score of 2.38). The quality control functions are present but not being utilized. 22% respondents indicated using the quality control module and finally printing the quality control certificates to accompany the products to the market. This being done outside of the ERP system, however, because it poses challenges when lot recalling any defective products. According to Gupta et al (2004), however, implementing and executing statistical process control and quality control tests in the ERP system enables easy and fast product recalls.

On results, from the production computations and bills of material, 50% of the respondents indicated that they do have some calculations they still perform outside of the ERP system, related to production (mean score of 2.06). These may include extra product dimension calculations and production variance calculations. Ideally this should be catered for by a product bill of material function or production structure function. Regarding product development, 67% of the respondents indicated that they do have product development activities done outside the ERP system (mean score of 1.5). These activities include production and testing of new products and testing of product variants. Product development must be carried out in the ERP system to track product life cycle before it enters actual production. During product development it is imperative to know the market needs and reviews on a concept being developed (Majava, Nuottila, Haapasalo, & Law, 2014).

Modules like the Customer Relationship Management (CRM) can be used to track feedback from the market as a product goes through the various product development stages. An ERP system can aid in decisions relating to probable supplier and final costs of production for various prototype production iterations. Organizations can spend more time on prototype decision making rather than

manual data capturing and reconciliations enhancing successful product launches. The sampled subjects were asked on the correspondence of their stock take

balances in the ERP system with that from physical stock on the ground if there was any difference or deviation. Table 4 presents results from the survey.

Table 4. Matching of stock on hand to ERP system

Stock Deviation	%	Sum	Mean	SD	Variance
40-60%	6	1	0.25	0.5	0.25
60-80%	22	4	1	1.15	1.33
80-100%	72	13	3.25	2.06	4.25

Survey results, as presented in Table 4 indicate that 72% of respondents have the ERP system reported quantities matching the physical quantities counted within a range of 80 – 100% (mean score 3.25). 28% indicated a matching of less than 80%. ERP system quantities must match physical inventory on hand indicating all

inventory related entries are updated correctly and in real time. Respondents were asked questions relating to various commonly used Key Performance Indicators (KPI) to find out the percentage of KPIs they are obtaining from the ERP system and those done manually.

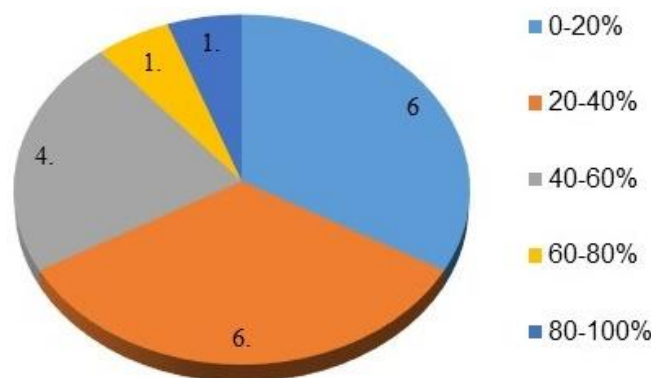


Figure 7. Percentage of KPIs done manually outside of ERP system

Figure 7 indicates that two organizations had more than 60% of their KPIs outside the ERP system. 33.3% (6 organizations) indicated having less than 20% of their KPIs done manually. Another 6 organizations indicated between 20% and

40% of their KPIs done manually. In summary 66% of respondents had more than 60% of their KPIs extracted from the ERP system.

The results presented in Figure 8 shows that KPIs related to cost per unit, and work-in-progress as are mostly reported by organizations. These are critical KPIs for any manufacturing organizations to track production processes and related costs. The results indicate manufacturing organizations sampled are mostly concerned with costs movements of the production process as compared to other production related functions and analysis metrics.

Table 5 and Figure 9 indicate positive responses in relation to the surveyed organization’s managerial functions. Summary results extraction from Table 5

apparently show that 89% of respondents indicated better resource management (mean score 2.45); 83% of respondents indicated improved asset management (mean score of 2.22); 67% of respondents

agreed the ERP system helped improve improved labour utilization (mean score of 1.83); 89% of respondents indicated the ERP system helped with improved decision making (mean score of 1.41); and 78% of respondents indicated better performance control (mean score of 1.29). Respondents indicated of being able to manage production resources, make cost control decisions and being able to make decisions pertaining to production schedules. However, respondents negatively commented on the lack of ERP system dashboards to track resources movements, plant life and customer demand trends using automatic system alerts on a real time basis. As part of expectations, ERP systems are supposed to enhance decision-making by providing accurate and timely enterprise-wide information (Poston & Grabski, 2001).

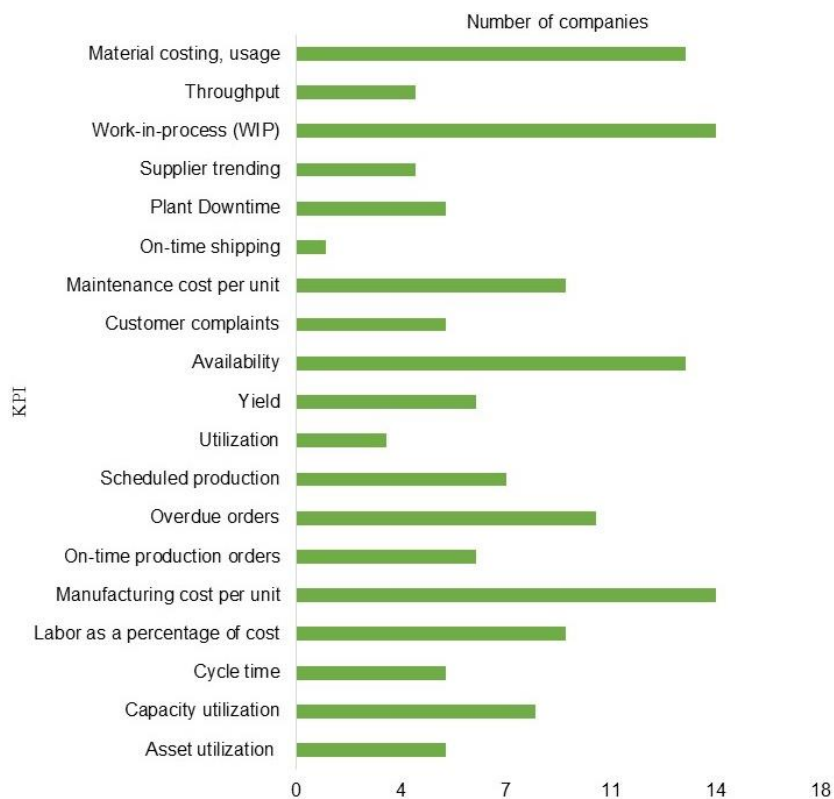


Figure 8 Distribution of KPI utilized

Table 5. Managerial Impact

Function	Y/N	%	Sum	Mean	SD	Variance
Better resource management	Yes	89	16	4	2.45	6
	No	11	2	0.5	0.58	0.33
Asset management improved	Yes	83	15	3.75	2.22	4.92
	No	17	3	0.75	0.96	0.92
Labor utilisation	Yes	67	12	3	1.83	3.33
	No	33	6	1.5	0.58	0.33
Improved decision making	Yes	89	16	4	1.41	2
	No	11	2	0.5	0.58	0.333
Performance control	Yes	78	14	3.5	1.29	1.67
	No	22	4	1	0.82	0.67

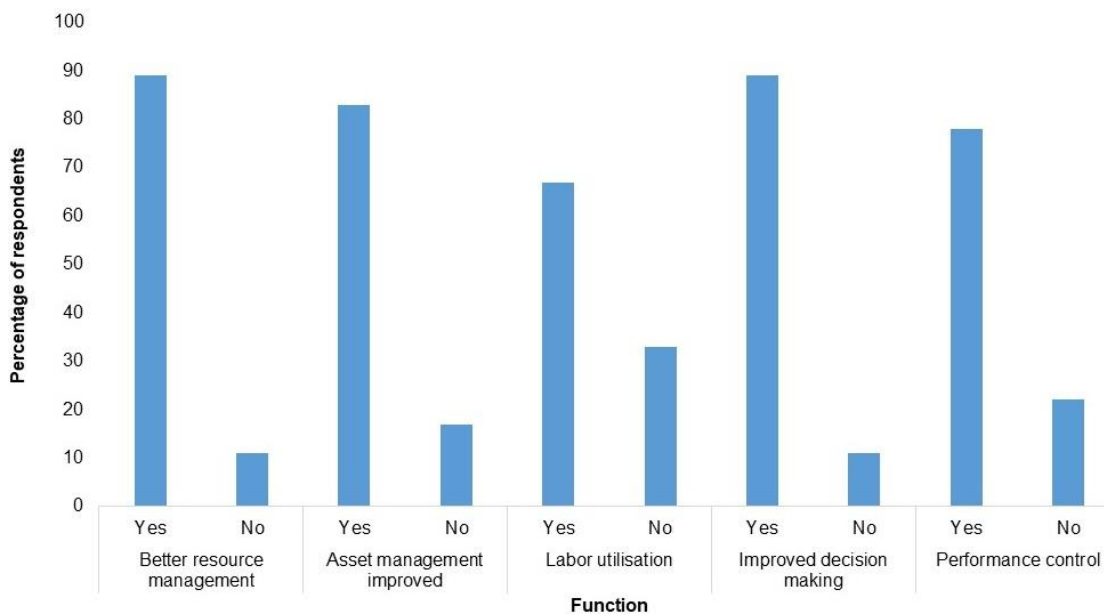


Figure 9. Managerial Utilisation

Survey results on the overall utilization of ERP systems relating to managerial functions - responses from participants on the impact of ERP system on managerial functions are presented in Table 5 and Figure 10

The results of the overall organizational impact of utilization of the ERP system on, survey responses from participants, on the impact of ERP system on organizational functions are presented in Table 6 and Figure 10.

Table 6 Overall Organizational Impacts

Function	Y/N	%	Sum	Mean	SD	Variance
Support organisational structures	Yes	89	16	4	1.83	3.33
	No	11	2	0.5	0.58	0.33
Operations efficiency improvement	Yes	83	15	3.75	1.5	2.25
	No	17	3	0.75	0.96	0.92
Employee morale increased	Yes	89	16	4	1.41	2
	No	11	2	0.5	0.57	0.33
Broaden employee skills & empower them	Yes	94	17	4.25	2.22	4.92
	No	6	1	0.25	0.5	0.25
Ownership of the ERP system	Yes	78	14	3.5	1.73	3
	No	22	4	1	0.82	0.67
Shift from data capturing	Yes	78	14	3.5	1.73	3
	N	22	4	1	0.82	0.67

Table 6 and Figure 10 indicate a positive response to ERP system impact in relation to organizational concerns. The results adduced are that 89% of respondents concurred that the ERP system supports organizational structures and any changes that may be requested; 83% of respondents indicated an improvement in operations efficiency; 89% of respondents indicated an improvement in employee morale; 94% of respondents indicated the ERP system enabled employee empowerment and broadened employee skills; 78% ERP system users have taken ownership of the system; and 78% of respondents indicated a shift from data capturing to planning. Generally, operational level respondents indicated that, with the introduction of the ERP system, certain roles have been

eliminated, some consolidated, and has improved operational problem solving by employees. Respondents also indicated readily available information throughout the organization, a decline in repeat jobs and less duplication of work. This concurs with findings by Masini & Van Wassenhove (2009) highlighting, that ERP systems have significant impact on organizational capabilities. In agreement Shang and Seddon (2002) also indicated that ERP systems are beneficial to achieving organizational goals. However, some organizational capabilities can be impacted by adopting an ERP system, such as accurate and fast information accessibility helping employees work together across functions; employees sharing resources, ideas, and data, informally work together as a team, and

achieve goals collectively with other employees from different departments. This eliminates communication barriers; and establishment of an accurate

backbone data warehouses to retrieve accurate information for decision making and performance control, (Vonderembse, Hwang, and Hassabelnaby2011).

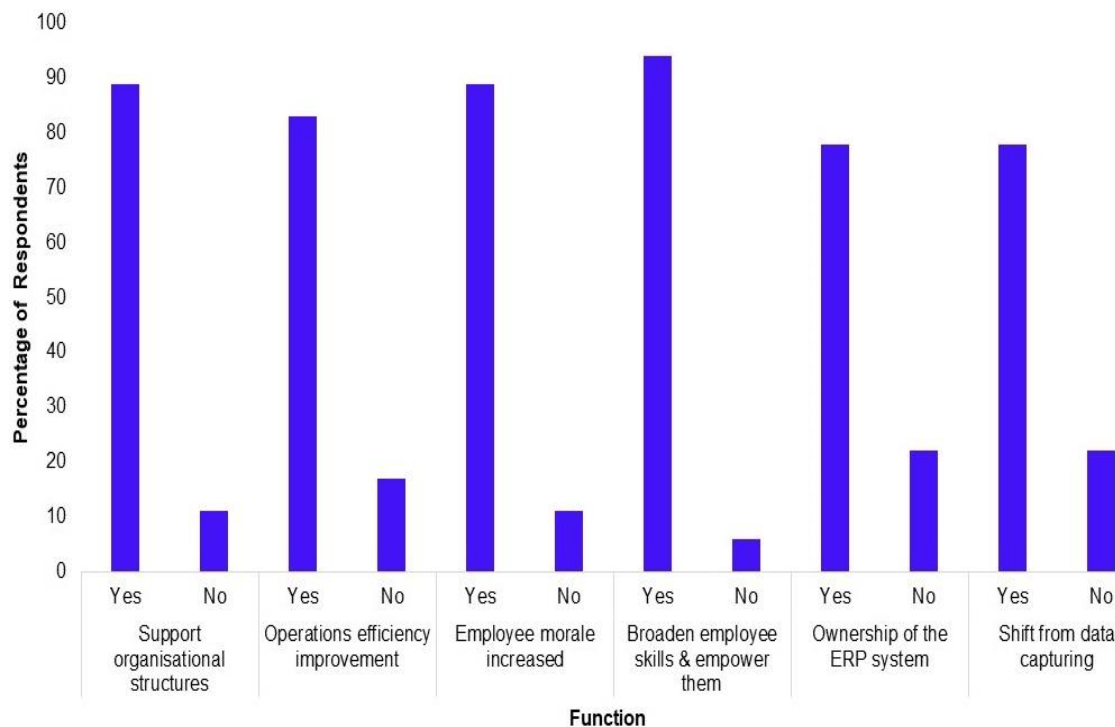


Figure 10 Organisationnel Utilisation

There was also, however, highlighted lack of other key aspects to control human resources on the production floor. That is a human resources function which would be integrated to production floor labour resources. Automatic alerts of due actions, by the ERP system were indicated not prevalent e.g., mobile alerts when stock levels reach specified levels, business intelligent functions integrated to the production plant for real time updates.

On the overall impact of ERP system on strategic functions, the response results from the survey participants are presented in Table 7 and Figure 11.

Respondents indicated an overall positive response for the strategic ERP system utilization measure. A summary of the results presented in Table 7 and Figure 11 outline the following facts: 61% of respondents agreed that ERP systems are handling most of their business operations; 72% of respondents indicated ERP systems enabled them to integrate their supply chain; 78% of respondents indicated product differentiation i.e. an ERP system tailor made for their operations; 83% of respondents indicated a support of their business alliances by using the ERP system; and 72% agreed that the ERP

Table 7 Overall Strategic Impacts

Function	Y/N	%	Sum	Mean	SD	Variance
Handling all business operations	Yes	61	11	2.75	0.96	0.92
	No	38	7	1.75	0.96	0.92
Supply Chain integration, automatic orders	Yes	72	13	3.25	1.25	1.58
	No	28	5	1.25	0.96	0.92
Product differentiation e.g. customised modules	Yes	78	14	3.5	1.29	1.67
	No	22	4	1	0.82	0.67
Support business alliances	Yes	83	15	3.75	1.5	2.25
	No	17	3	0.75	0.96	0.92
Adaptation to industry	Yes	72	13	3.25	1.25	1.58
	No	28	5	1.25	0.96	0.92

system allowed easy adaptation to industry policy changes. These findings seem to support, what Kováč & Kadarova (2014) highlighted, that to be successful an organisation needs to integrate its business strategy and the ERP system

strategy, whilst Villard & Ucakurk, (2013), in concurrence, maintains that this allows development of products, services and competencies providing a competitive advantage for organizations over their competitors.

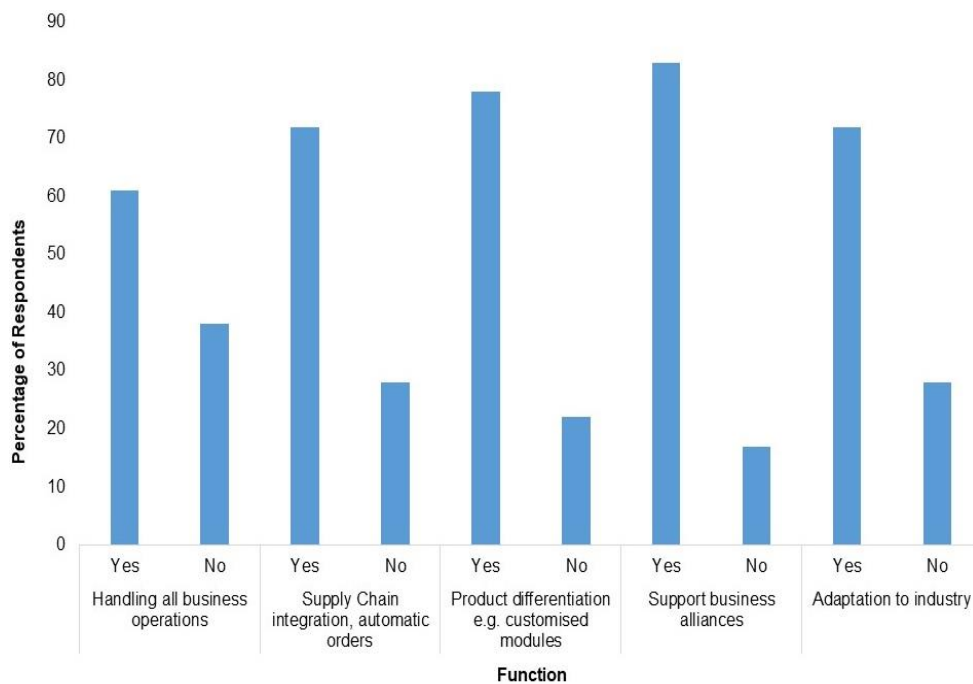


Figure 11 Strategic Utilisation

However, functionality to enable easy market segmentation and predict future sales by product, market, season, and region was highlighted as a need. Business intelligence tools were requested as a tool that Strategic Managers would

require to track and monitor history and predict future trends of the business. Table 8 indicates 61% respondents highlighting the ERP system assisted them fulfill company strategy 61-80% of their targeted strategic goals.

Table 8 Fulfill Company Strategy

Fulfill company strategy	Sum	%	Mean	SD	Variance
81%- 100%	7	39	1.75	1.5	2.25
61%-80%	11	61	2.75	0.96	0.92

5. CONCLUSIONS

The research studied, and analyzed data adduced from an empirical survey of, ERP system application impact in the manufacturing enterprises of Zimbabwe. A purposive sampled set of 38 manufacturing enterprises were surveyed with 18 organizations responding enabled by the aid of study questionnaires targeted at them as possible respondents. The sampled companies were manufacturing companies using an ERP system to manage their operations. The survey results did confirm that there are manufacturing organizations who have adopted the use of an ERP system. Overall, for the managerial, organizational and the strategic frames there exists a positive impact by adoption of an ERP system. For inventory and manufacturing operations majority of organizations indicated no use of batch tracking, product development being handled manually outside the ERP system, some production related calculations performed outside of the ERP system, MRP and MPS not being run using the ERP system, no system generated quality certificates and lastly even though there is stock planning, some organizations experience cases of stock shortages.

The research suggested performance metrics which can be used to assess the Operational, Managerial, Organizational and Strategic functions. These were presented in the form of questionnaires for each function. In responding to questionnaires pertaining to each framework additional success performance metrics were deduced. These were business intelligence reporting which includes dashboards which are automatically updated as operations are underway and mobile integration of operations. These have been highlighted as shortfalls in defining success of ERP systems and must be added to performance metrics.

Results aligned with inventory and manufacturing operations which organizations can implement to fully use ERP systems were presented. Relating to procurement, organizations with a longer procurement cycle should consider e-procurement such the that purchase cycle is reduced and there is shareable data to monitor and improve supply arrangements, thereby adding value to supplier relationships. This will assist greatly in situations such as, typically, if there is a bottleneck in a supplier's production facility, alternative plans are

made to source alternative raw materials, such as ordering from a backup supplier, rescheduling production, and assembly operations, and informing customers of potential delays.

With regards to stocks replenishment, organizations who do not have stock replenishment parameters implemented in the ERP system could consider implementing so - stock keeping, reorder point, reorder quantity, minimum and maximum inventory, batch quantity, and safety stock quantity. This aids in minimizing stock outs or overstocking. Periodic review of lead times and sales order due dates must be done so MRP / MPS works accurately reflecting any rescheduled orders. Organizations should consider implementing ABC analysis for their stock and an inventory optimization module. This will assist in reaching a balance with other factors such as transportation costs and human resources on which inventory is dependent on.

Regarding the Master Production Scheduling and Material Requirements Planning, organizations could derive sales forecast data based on periodic sales trends of each product. The sales forecast could be converted to or act as a production forecast. To reduce forecast errors, the forecasts must be reviewed and replanning done to reflect market changes and customer preferences. In terms of yield reporting, organizations could ensure their ERP system provides them with a standard cost of producing a batch or single unit. These standards may be reviewed periodically to ensure they reflect the economic environment, such as labour rates, capacity costs, and that they are in line with actual expenditures on the production floor. ERP system reports would be designed (if not available) to reflect the expected costs of a batch and the actuals, and the source of variances may be displayed for easy interpretation. This will assist organizations track sources of inefficiencies; measure amount of rework done and track their yields.

Organizations could also incorporate product development processes in the ERP, as an obsolete entity, which does

not update the financials but used for product development and cost iterations. Product market reviews may be done through a customer relationship management function in the ERP system for market feedback to be updated direct in the ERP system. This allows organizations to spend time on prototype decision making rather than manual data capturing and reconciliations. ERP systems can allow for profitable and successful product launches. Furthermore, organizations could be provided with regular upgrades provided by the ERP system architects to avoid customization on functionality that could have been standardized. Upgrades of ERP system helps organizations stay abreast with latest functionality and technologies easing operations.

In standardizing Key Performance Indicators, organizations should analyze their goals and determine success factors. These could be translated into organizational key performance indicators to show how the organisation is doing in meeting its targets. This allows for quick adjustments to processes if KPIs are tracked effectively. KPIs can be designed as automatically generated reports or real time dashboards in the ERP system. The KPIs need to be reviewed periodically to ensure that they are still aligned to any business process changes. Relating to strategic functions, organizations could review their current state map and define their future state maps in terms of business strategy, the ERP system functions may then be executed according to the review. The future state map would outline the expected benefits and reporting needs after aligning the ERP software with the overall organization's strategy. A cost benefit analysis must be done i.e., cost and business impact of continuing with some operations manually done outside the ERP system, and the cost of implementing, supporting, and training of the functions in the ERP system. This will assist in identifying gaps in reporting and functionality overlaps. This will help the organizations move forward with a tailor-made ERP system strategy rather than execute the ERP system vendors own

defined strategy or just executing as availed.

Pertaining to organizational functions, organizations lagging in utilizing the ERP system's organizational functions should consider and implement the management of employee resistance towards the new ERP system at the initial stages of the implementation project with change management workshops, to maximize acceptance; provide reasonably adequate training and user specific manuals for all employees who will encounter the ERP system functionalities both directly and indirectly. Operational and system manuals should be provided to the employees to ensure all stakeholders are aware of the organizations expectations; training could be provided by external ERP system consultant or internal ERP super users to curb knowledge erosion as information is passed on from one user to the other; review of the ERP system process flows and user manuals together with the employees who will likely directly or indirectly use the ERP system. This avoids them dismissing the ERP system as an Information Technology Department's object and refuse ownership; and have feedback loop sessions to regularly review organizational issues related to the use of the ERP system as a continual or periodic exercise. In order to fully realize the benefits, on the managerial functions, organizations can implementing ERP system dashboards and automatically generated reports which prompt and update an organization's transactions in real time; increase performance control by making use of customer relationship management to assist in analyzing market segments and opportunities for the organisation; and implementing business intelligence / dashboards for quick managerial reporting and reviewing of business operations.

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