

APPLYING INFORMATION SYSTEMS BY POLISH ENTERPRISES AND THE ANALYSIS OF THE CRITERIA FOR ADOPTING A PARTICULAR SYSTEM.

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Abstract:

Considering marked changes in business, entrepreneurs must have constant access to a lot of information about their business status and business activity. Modern information systems allow them to find methods and tools to achieve this goal.

The purpose of this paper is to assess the scope of the application of information systems in Polish companies. ERP, CRM, BI, DSS, MIS and GIS systems were analyzed. Furthermore, the authors of the article examined the importance of a variety of criteria which companies take into account when deciding upon a specific information system.

So far, a number of publications have already described the structure, assumptions, functionality and application possibilities of information systems. However, the correlation between the company size and the type of information system used should be analysed. Moreover, an in-depth analysis of the criteria for selecting alternative systems is required. Therefore, the authors of the article determine the key aspects of choosing a particular system from a company's perspective.

The research conducted involved a survey addressed to 150 Polish companies of different sizes. It reveals that company size is an essential factor when choosing an individual system. It is also of importance as far as choice criteria are concerned. Developing organizations tend to choose 'first-need' systems whereas highly – developed companies prefer more comprehensive systems which also offer effective management solutions.

Keywords: information system, system choice criteria, ERP, CRM

1. SYSTEM DEFINITION

Under the term 'system' we understand an organization whose properties and methods of operation do not equal the mere sum of properties and methods of operation of the organization's individual parts; on the contrary, it is an entity that should be perceived holistically. However, if we know the company's individual parts and the relation between them, we can use them to understand the company's different tiers. Such a definition of a system was offered by Ludwig von Bertalanffy, an American biologist, in the 1930s.

According to Flakiewicz (2002) The system:

- has a meaning,
- completes tasks in one or more ways,
- its components make the structure of the system
- different system components as well as individual components and the system as a whole interact to make the system successful.

2. CHARACTERISTICS OF THE SYSTEMS

2.1. ERP

ERP comprise a group of systems which facilitate the functioning of every department in a given company and they develop from MRP II programmes. P. Lech's definition of ERP systems stresses the key aspect of integrating the company's business activity with that that of deliverers and clients.

Class ERP systems allow careful planning and detailed analysis of internal processes. However, they do not empower the company to directly steer or control external processes, e.g. those referring to the company's customers or deliverers. Modern internet technologies offer a workable solution here by integrating external elements into the company's internal structure and the internal information flow. Hence, a broad, holistic and integrated value and supply chain is formed instead of a number of separate and detached market players acting individually. As soon as the company's integrated system appears online, further integration between this and other companies' systems follows (B2B solutions – business to business). B2C solutions (business to customer) entail the integration between customers and the company's business activity, as the real – time access to company's profile, its resources and activities is ensured via WWW channels. ERP II systems, also known as Enterprise application suite, describe web-based software which allows the enterprise to interact with other enterprises, suppliers and customers.

The main objective of ERP systems is to integrate the management of both external and internal information across the entire organization. ERP comprises manufacturing, distribution, sales and service, accounting and finance – it facilitates information flow between all departments and it addresses all key functions of any enterprise, making it possible to react to any demand fluctuations.

The authors of the ninth edition of APICS Dictionary (Blackstone and Cox, 2005, page 357 - 363) provide another definition of ERP systems. ERP build a "framework for organizing, defining, and standardizing the business processes necessary to effectively plan and control an organization so the organization can use its internal knowledge to seek external advantage". S.Ghosh and M. J. Skibniewski from Journal of Business Economics and Management define ERP as the enterprise's data and processes integrated into a single system. They are specific software suites which include different modules, such as human resources, sales, accounting/finance and manufacturing and which allow its users to view the company as a whole thanks to the integration of data managed during a variety of business processes.(Ghosh and Skibniewski, (2010) *Implementation As A Complex Project: A Conceptual Framework*, study find in Enterprise Resource Planning Systems)

ERP systems derive from MRP systems (Material Requirements Planning), i.e. material planning systems which developed in the 1950s. MRP systems are intended to calculate the exact amount of materials and develop such a delivery schedule as to meet the ever-changing demand for various products with respect to more than one factory. At the same time, MRP enables to track inventory and determine the schedule for orders necessary to keep the inventory at a specified level.

The main objectives of MRP include:

- Reducing inventory – materials and products should be maintained at the lowest possible level to increase the company's financial liquidity and capital turnover ratio,
- determining the precise delivery times of raw materials and semi-finished products,
- calculating the exact production costs,
- facilitating the utility of existing infrastructure (warehouses, manufacturing capabilities)
- ensuring flexibility and spot-on response to changes in the environment
- controlling various production stages.

2.2. CRM

CRM, or Customer Relationship Management, may pose a problem as for the incorporation of the system into the company structure. Many people hold a mistaken belief that CRM is nothing more but a computer software which serves a function as an interface between the company and its contractors. Nevertheless, such perception of CRM systems is too narrow as the implementation of CRM strategy often affects the entire organization. Ronald S. Swift (2000) definition allows a broader view on CRM: "CRM is the company's ability to acquire customers, getting to know them, renewing contacts with them, make sure that the company provides them with exactly what they want, and that to which the committed, and finally - realize profits from these activities."

However, if we want to have the software to focus on, CRM systems would include these systems which comprise the majority of the following modules (by Parzydło; CRM, czyli świadoma sprzedaż, study find in TELEINFO 43/1999):

- Sales - relationship management (customer profiles, the structure of institutional clients, contact history of sales and service), customer account management (sales activities, orders, generating quotes).
- Sales management - pipeline or sales funnel analysis (prediction, the analysis of the sales cycle), sales allocation to the customer's account and territory, monitoring the status of the customer and potential sales (sales opportunity) –with regard to the company's organizational structure and sales strategy.
- time and territory management - calendar and database of a single user or a group.
- Correspondence - mail, e-mail, fax.
- Marketing - Campaign Management, encyclopaedia of products, product configuration, pricing, deals, generating mailing lists, analyzing the effectiveness of the campaign.
- trade management - collecting and distributing information about customers interested in the company's products and the identification of the sales leads
- Telemarketing –arranging telephone directory according to the target groups, auto-dialing, generating sales leads, collecting orders.
- Customer service and after –sales support - allocation, tracking and task reporting, problem management, controlling orders, warranties..
- Information - varied, easy-to-use reporting function, often based on OLAP (On-Line Analytical Processing).
- Integration with ERP systems - accounting, manufacturing and distribution.
- Data synchronization - between mobile devices and the central database, or among a variety of central databases and application servers.
- E-commerce.
- Call center.

2.3. DSS

Another type of information system is DSS system, i.e. Decision System Support. DSS systems are computer based systems which support business and organizational decision making activities. Professional literature provides many DSS definitions, each of which highlights other aspects of DSS. Haettenschwiler, for instance, differentiates between passive, active and cooperational decision system support depending on the user. Passive DSS is a system which can support decision making activity, yet it does not offer any feasible or complete solutions. Active DSS does generate potentially viable decisions and practical solutions. Cooperative DSS allows the decision maker (or its advisor) to modify, complete or refine possible decision suggestions provided by the system before sending them back for validation. The system improves, recompletes and refines previous decision suggestions and sends them back for revalidation. The process is repeated until a satisfactory solution is found.

Decision Support Systems are a group of decision-making support systems for problems with a more or less complex structure. It supports primarily tactical and strategic management at various phases of decision making process, concerning a part or the entire enterprise. Construing DSS systems should meet some basic requirements:

- The system must improve decision-making processes rather than office work,
- The system must support decision making activities and not automate them,
- The system must be flexible enough to quickly adapt to changes that a decision maker might introduce. (According to Kasprzak T., 2003, *Biznes i tehnologije informacyjne*)

Generally, Decision Support System has the following characteristics and features:

- it supports the problem definition phase,
- it supports a variety of styles and decision-making processes,
- it is easily adaptable and flexible
- it is interactive and easy to use for the end user
- it facilitates decisions independently or interdependently
- it is created for managers at different levels as well as for individual users.

Decision Support System can be evaluated by:

- the result of the decision,
- the frequency of changes in the decision-making process,
- procedural changes,
- changes in disclosing the decision situation by the decision maker,
- the analysis of the costs and effects,
- the quality of service,
- the estimated value of the system,
- users' feedback on the system.

Each of these variants of evaluation may be useful in different situations. Cost analysis, for example, allows an objective and rational assessment of the effects of the use of the system whereas users' feedback ensures a more subjective perspective.

Improving the efficiency of decision-making by using DSS is proved by:

- reducing the cost of decision-making,
- a more accurate preparation of documentation,
- reducing delays in decision-making.

2.4. MIS

MIS systems form that part of an information system which is isolated from the remaining business activities of the company. It is software which facilitates information flow within corporate walls. According to R. M. Stair (2007) a management information system is an "organized collection of people, procedures, processing, databases, and devices used to provide information to managers and decision-makers" while E. Turban (2005) states that "management information system is a formal, computer system, designed to provide access, select and integrate obtained from different sources of information in order to provide updated information necessary for management decisions".

2.5. BI

BI systems (Business Intelligence) comprise a group of tools which help gather, transform and analyze information, which, consequently, leads to facilitating the process of decision-making. They include:

- OLAP tools (on-line analytical processing)
- data exploration systems,
- knowledge management systems

The main task for BI systems is to make it easier to access data, coordinate advanced analytical processes, produce and distribute reports for end users. These systems function upon highly-developed database called data warehouses where aggregated information from source systems is stored. Analytical and reporting components of BI systems serve to conduct analyses and make

reports accordingly. Presentation tier provides useful information for end user. According Jerzy Surma, 2009, *Business Intelligence, Systemy wspomagania decyzji biznesowych*.

Follow Surma (2009), the main reasons for applying BI systems in companies include:

- Improving effective management,
- The analysis and improvement of operational efficiency,
- Building strong bonds with clients thanks to an in-depth analysis of consumer behavior patterns and current market trends.

2.6. GIS

The last group of the systems which we have decided to analyze are GIS systems (Geographic Information Systems). GIS systems are systems used to gather, transform and analyze data containing spatial information as well as accompanying descriptive data concerning the objects which appear in the area where the appropriate GIS systems are in use. (Jerzy Gaździcki, *Systemy informacji przestrzennej*, Państwowe Przedsiębiorstwo Wydawnictw kartograficznych, Warszawa 1990)

GIS systems are primarily used for visualization (making maps, also in 3D) and they are helpful as far as navigating different types of transport as well as geospatial and construction works go. Furthermore, they may offer invaluable solutions for any businesses where geographical data are used (sales analysis, distribution, route planning).

The authors of the article conducted research among 150 Polish companies in order to show how information systems are applied in various enterprises. The enterprises were divided by their size – large, medium-sized, small and microenterprises were researched. ERP, CRM, MIS, DSS, BI and GIS systems, which were briefly described in the first part of this article, were given the analysis. Respondents comprised a group of employees who completed questionnaires about the application of the above- mentioned systems in their companies, depending on the type of the system in use. Incomplete or invalid questionnaires were rejected. Finally, the analysis comprised 103 responses which led to valid conclusions and upon which the following tables and graphs were created.

3. RESULTS OF THE RESEARCHES

Table 1: illustrates the relation between company size and the application of ERP systems.

The size of the Enterprise	is currently used	is going to be introduced	the system is neither used nor going to be introduced	TOTAL SUM
1. Microenterprise	3,70%	18,52%	77,78%	100,00%
2. Small enterprise	29,41%	23,53%	47,06%	100,00%
3. Medium-sized enterprise	64,29%	21,43%	14,29%	100,00%
4. Large enterprise	78,57%	21,43%	0,00%	100,00%

Source: own research

Clearly, the popularity of ERP systems grows with the company size. Microenterprises hardly ever use the systems in question in contrast to medium-sized and large companies, the majority of which use ERP systems systematically. Furthermore, it is medium-sized and large companies that express a strong intention of introducing ERP systems to their companies in the future. On the other hand, more than ¾ of microenterprises do not plan to apply ERP systems at all. It is also worth noticing that every fifth company questioned, irrespective of its size, is planning to introduce ERP system.

Table 2: illustrates the relation between company size and the application of CRM systems.

The size of the Enterprise	is currently used	is going to be introduced	the system is neither used nor going to be introduced	TOTAL SUM
1. Microenterprise	3,70%	18,52%	77,78%	100,00%
2. Small enterprise	14,71%	26,47%	58,82%	100,00%
3. Medium-sized enterprise	46,43%	10,71%	42,86%	100,00%
4. Large enterprise	64,29%	28,57%	7,14%	100,00%

Source: own research

The application of CRM systems is similar to the trend indicated by ERP systems. The majority of large enterprises use or plan to introduce ERP systems as opposed to microenterprises which do not intend to do so. Interestingly, more than 40% of medium-sized enterprises do not plan to invest in CRM systems. Its lack may hinder the desired evolution of the company.

Wykorzystanie systemów CRM wykazuje podobny trend jak w przypadku systemów ERP.

Table 3: illustrates the relation between company size and the application of MIS systems.

The size of the Enterprise	is currently used	is going to be introduced	the system is neither used nor going to be introduced	TOTAL SUM
1. Microenterprise	7,41%	7,41%	85,19%	100,00%
2. Small enterprise	14,71%	17,65%	67,65%	100,00%
3. Medium-sized enterprise	35,71%	25,00%	39,29%	100,00%
4. Large enterprise	57,14%	28,57%	14,29%	100,00%

Source: own research

As far as the application of MIS systems in companies of different sizes is concerned, we can observe that they are less commonly used by large enterprises than ERP and CRM systems. Optimistically, ¼ of large and medium-sized companies want to invest in these solutions. At the other pole are microenterprises, 2/3 of whom do not intend to launch MIS systems at all. It is likely that smaller interest in MIS systems (as compared to ERP and CRM systems) may result from the fact that company needs which could be addressed and fulfilled with the help of MIS systems have not been clearly recognized.

Table 4: illustrates the relation between company size and the application of DSS systems.

The size of the Enterprise	is currently used	is going to be introduced	the system is neither used nor going to be introduced	TOTAL SUM
1. Microenterprise	3,70%	0,00%	96,30%	100,00%
2. Small enterprise	11,76%	8,82%	79,41%	100,00%
3. Medium-sized enterprise	17,86%	17,86%	64,29%	100,00%
4. Large enterprise	57,14%	14,29%	28,57%	100,00%

Source: own research

DSS systems in Poland are rarely used by micro-, small and medium-sized enterprises. No more than 20% of all enterprises in any of the groups researched use these systems. What may be worrying is the fact that more than 50% of mid-sized companies do not intend to introduce DSS systems. Similarly, 30% of large enterprises do not notice the need to apply DSS systems which may negatively influence the functioning of the company in a dynamic competitive environment in the future.

Table 5: illustrates the relation between company size and the application of BI systems.

The size of the Enterprise	is currently used	is going to be introduced	the system is neither used nor going to be introduced	TOTAL SUM
1. Microenterprise	3,70%	11,11%	85,19%	100,00%
2. Small enterprise	17,65%	20,59%	61,76%	100,00%
3. Medium-sized enterprise	46,43%	10,71%	42,86%	100,00%
4. Large enterprise	50,00%	21,43%	28,57%	100,00%

Source: own research

The research on BI systems proves growing significance of these solutions in enterprises. Half of large and medium-sized companies already use these systems and a considerable group of them still plan to introduce them. It is a promising observation especially when world trends in this aspect are taken into account. BI systems offer analytical solutions which help unburden transactional systems from accounting and reporting processes. The fact that about 40% of small enterprises use or plan to use BI in their business should not escape our attention. It shows growing awareness of modern information technology solutions among small enterprises.

Table 6: illustrates the relation between company size and the application of GIS systems.

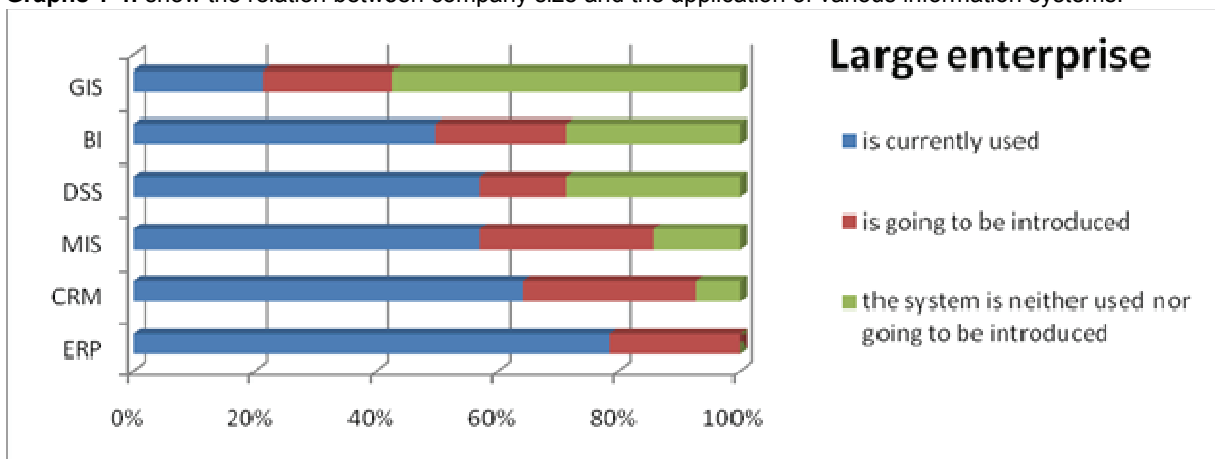
The size of the Enterprise	is currently used	is going to be introduced	the system is neither used nor going to be introduced	TOTAL SUM
1. Microenterprise	3,70%	7,41%	88,89%	100,00%
2. Small enterprise	11,76%	20,59%	67,65%	100,00%
3. Medium-sized enterprise	21,43%	17,86%	60,71%	100,00%
4. Large enterprise	21,43%	21,43%	57,14%	100,00%

Source: own research

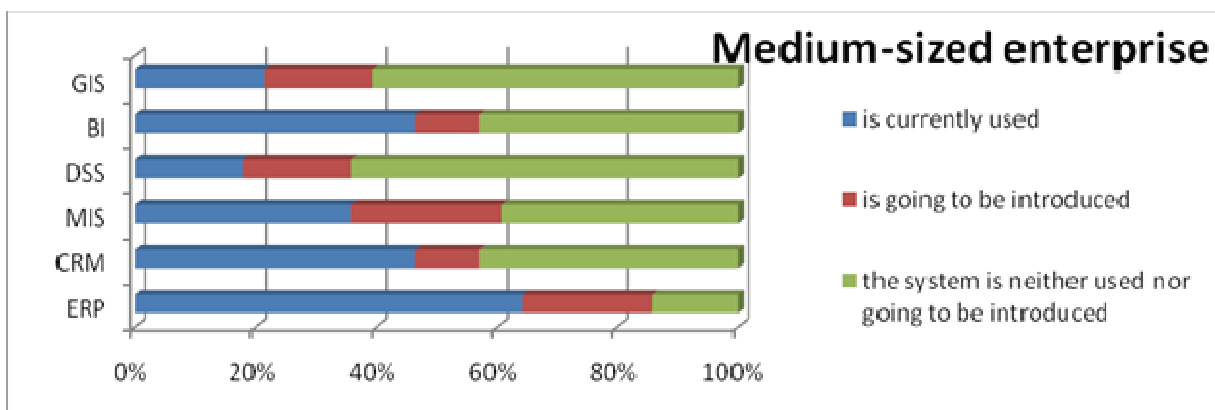
The research illustrates that, regardless of the company size, GIS systems are not popular among Polish enterprises. Only slightly above 1/5 of large and medium-sized companies use these system and another 20% plan to introduce them in the foreseeable future, That means that more than 50% of companies do not plan investing in GIS systems. The situation is even more dramatic among small and microenterprises: 2/3 of small enterprises and more than 90% of microenterprises show no interest in GIS solutions. This may result from little popularization of GIS systems in Poland and the fact they have not been present on the Polish market only until recently. The range of possibilities and solutions which they may offer is still being explored.

4. CONCLUSION

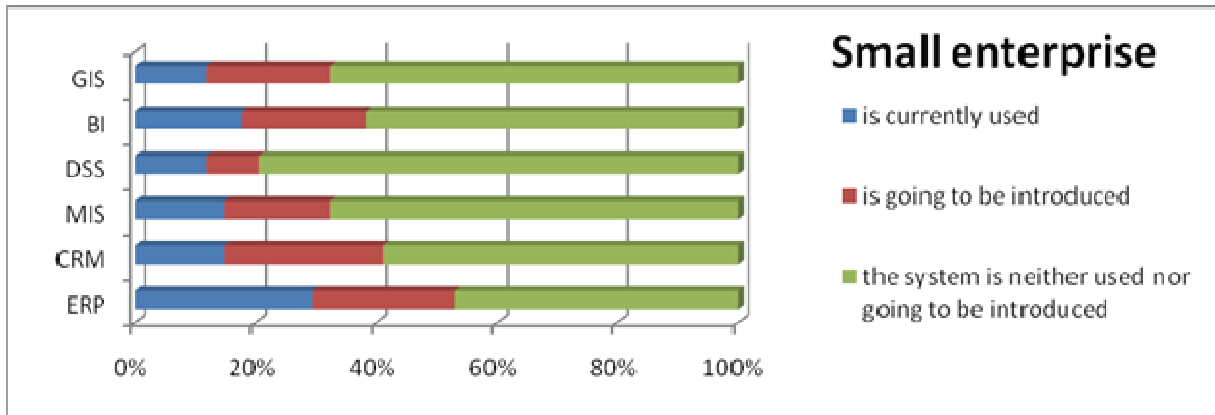
Graphs 1-4: show the relation between company size and the application of various information systems.



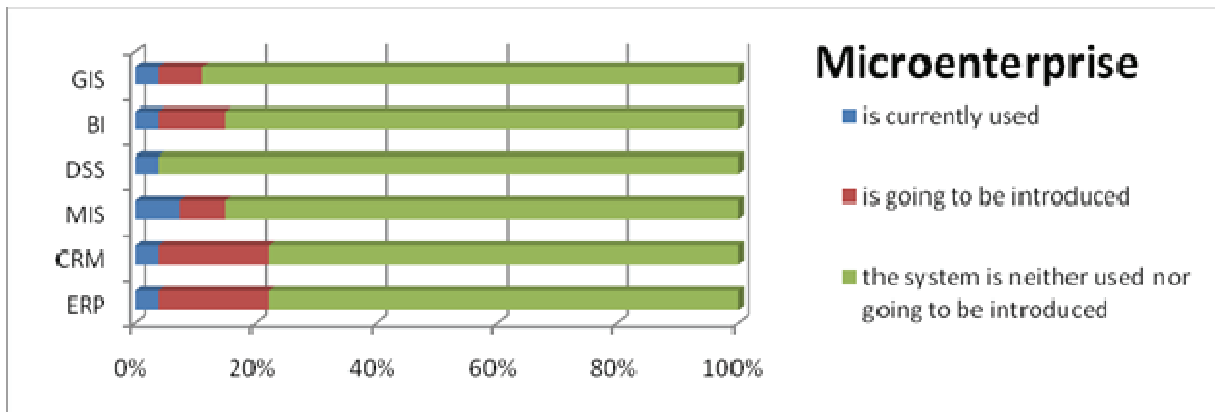
Source: own research



Source: own research



Source: own research



Source: own research

It is clear that the application of individual information systems grows with the company size. 80 % of microenterprises do not use at all any of the systems analyzed. Neither do they plan to introduce one. Although this number is smaller for small enterprises, it still exceeds 50% for any of the systems researched. Medium-sized enterprise which want to strengthen their market position should acknowledge the importance and usability of information systems. However, our research has shown that half of these enterprises are unlikely to apply any of the systems (with the exception of ERP). Such statistics are far from optimistic considering the conditions of today's economic milieu. The rejection of some of the systems offered will not enhance the development of the companies. On the contrary, it may lead to their stagnation if not market death. Large companies appear to notice the necessity to invest in up-to-date information systems to ensure their proper functioning and competitiveness. The research confirms that more than 50% of large enterprises do indeed use all of the information systems (apart from GIS) and a marked number are likely to introduce them.

The choice of a particular system seemed to be determined by the company size and its stage of development. Small organizations (micro- and small enterprises) need transactional systems such as ERP or CRM to facilitate basic business processes. Medium-sized or large companies do already have such systems and, therefore, they focus on more advanced solutions (MIS, DSS, BI). Their growth seems to be dependent on proper IT background, which explains their increasing interest in information systems. As far as the application of GIS systems is concerned, their relatively insignificant application may be explained with the fact that they have been introduced onto the Polish market only recently. Fresh as they may be, GIS solutions raise more and more interest every year. They will probably become a thriving industry in the foreseeable future.

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