Ranking of company performance indicators for managerial decision making purposes with application of the Delphi method.

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Abstract

The objective of the paper is to analyse the usefulness of various qualitative and quantitative indicators of economic condition of companies for managerial decision-making purposes. The research target group were medium- and high level executives of small and medium enterprises with Polish and foreign capital, operating locally and internationally. The research methodology included: (i) Delphi questionnaire for quantitative data gathering; (ii) two-stage direct semi-structured interviews for initial reduction of number of indexes and to provide qualitative context for gathered data; (iii) ABC method (Pareto-Lorenz diagram) for presentation and interpretation of findings. In result a set of universal indicators has been determined, counting such indexes as: (i) flexibility, (ii) level of income; (iii) number of clients; (iv) survival ratio. Practical implication is a faster and more accurate choice of indexes enhancing the speed and efficiency of managerial decision-making. Further research should be directed towards the elaboration of a multicriteria decision-making model, which would allow to incorporate various types of indicators of company's development, including the qualitative and quantitative ones. Research limitations come mainly from limited representativeness of chosen enterprises (they could be more specifically narrowed) and respondents. Presented research contributes to the increase of applicability of scientific tools for enhancement of managerial decision-making. Added value comes from addressing the need of managers for ease and rapidity of use of scientific decision-making methods.

Key Words: managerial decision-making, enterprise development indicators, business management, small and medium enterprises.
JEL Classification: D81, C44, M21

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Introduction

Economic crises affect economies in various ways. One of them is the need for a more accurate decision-making. Ironically this urge occurs in parallel to growing uncertainty of business environment of companies, when statistical forecasts do not provide credible foundations for strategic or operational planning. In result, managerial decision-making becomes more difficult, than in times of prosperity. This justifies the need for research on relevance of particular decision criteria, with a special focus on the question, whether their importance is anyhow related to the economic cycle, i.e. prosperity and recession.

The objective of the paper is to analyse the usefulness of various qualitative and quantitative indicators of economic condition of companies for managerial decision-making purposes. The additional goal of presented study was to find common patterns behind managerial decision-making by identifying which indicators of company development are taken into account by managers in times of prosperity and which during recession.

The research methodology included Delphi method and direct semi-structured interviews for data gathering and Pareto-Lorenz analysis for interpretation of findings. The research target group were operational, tactical and strategic level managers in Polish and foreign companies operating internationally.

1. Research methodology

Employed research methodology encompassed: (i) the classical Delphi method for quantitative data gathering; (ii) two-stage direct semi-structured interviews for initial reduction of number of indexes and to provide qualitative context for gathered data; (iii) Pareto-Lorenz analysis for interpretation of findings.

The Delphi method is a tool of group evaluation of a given complex problem or task by a panel of independent experts, based on a set of criteria, common for all the questioned people. Adler & Ziglio (1996) define Delphi as "*a structured process for collecting and distilling knowledge from a group of experts by means of a series of questionnaires interspersed with controlled opinion feedback*". Duval, Fontela and Gabus (1975) underline the value of expert opinions for decision-makers in a situation of permanent lack of full scientific knowledge in their daily routine. Helmer (1977) adds that "*Delphi represents a useful communication device among a group of experts and thus facilitates the formation of a group judgment*". A detailed discussion of Delphi applications can be found in Kwahar, N., & Iyortsuun (2018).

In practical Delphi applications the research problem is usually defined in form of one or more questionnaires. Adler & Ziglio (1996) point at their anonymity, Dalkey (1972) at controlled feedback, whereas Helmer (1977) at the need for statistical responsiveness.

Fowles (1978) identifies following stages of application of the Delphi method: (i) team formation; (ii) panel and experts selection; (iii) development of first round Delphi questionnaire; (iv) questionnaire tests (formulation of questions, proper wording, etc.); (v) expert answers for first round questionnaire; (vi) first round

response analysis; (vii) preparation and testing of second round questionnaires; (viii) expert answers for second round questionnaires; (ix) second round response analysis and repetition of steps 7 to 9 – if necessary; (x) final report elaboration. It should be noticed that experts are not required to elaborate any common statements, nor take a majority vote. The outcome of Delphi questioning can be put to statistical testing of hypotheses and then presented as numerical data or graphically.

The number of experts involved in obtaining responses hasn't been clearly defined, although some methods prove that at some stage the increase of the amount of experts does not provide significant changes in obtained responses (e.g. within the Analytic Hierarchy Process – Saaty, 2001).

Hanson & Ramani (1988) state that "*respondents to [a Delphi] questionnaire should be well informed in the appropriate area*". Scientific praxis allows ascertaining that a higher degree of expert knowledge allows the limitation of number of experts. Saaty (2001) goes even further by denominating this number to 5-9 respondents, under the assumption of their high level of expertise in the subject.

The applications of Delphi method vary from academic research and education, through public health issues and economic forecasting understood as help for decision-making, up to an exploration technique for forecasting of directions and trends of technological innovation as well as a tool enhancing discussions between experts (Cornish, 1977; Fowles, 1978; Wissema, 1982). More recent applications tend to incorporate into Delphi research also the interrelations between analysed factors, which is also the case of the present study.

A Delphi questionnaire has been employed to obtain quantitative data for further analysis. In order to provide ground for qualitative deepening of obtained answers and to understand their environmental context, direct semi-structured interviews with chosen experts in economic forecasting, business management and decision-making have been performed. The reason for additional questioning came from the specificity of research based on questionnaires. Although it proves to be a very useful, widely applied research tool, it limits the possibilities of answers to questions included in the questionnaire. Another reason is that an important part of questioned people tend to mark questionnaire answers only, without going into deeper explanations, despite the presence of "*another*" field meant to expand their answers.

For graphical presentation of acquired data a modified Pareto-Lorenz Diagram (known also as the ABC method) has been employed. Szumnarska (1996) states that this method is applied to identify and measure the importance of analysed issues. Only these problems will be identified, which – although being in minority towards the rest – bear a dominant, influence on analysed issue. Empirical validation of the ABC method proves that the mentioned ratio is usually around 20/80. Nevertheless, this proportion should not be seen as dogmatic.

For the needs of this study, the Pareto-Lorenz rule took form of a proposal towards decision-makers to choose only these indicators of development of their companies that provide possibly optimal decision-making results, but at a reasonable effort. Reformulating further this statement it can be assumed that analysing a bigger

number of factors (together with less relevant ones) will be inefficient and will not significantly increase the quality of final decisions.

Szumnarska (1996) enumerates following steps of the ABC method: (i) identification of type of analysed problems; (ii) determination of time span of analysis for later evaluation of decision-making effects; (iii) finding the frequency of occurrence of particular categories; (iv) setting data in diminishing frequency of occurrence order, calculation of proportional and cumulated frequencies; (v) assigning scales for axes: horizontal – categories and vertical – frequency of occurrence (absolute value) and cumulated proportional value; (vi) putting values onto the graph in increasing order – frequencies of occurrence for each category (Pareto diagram) and curve of cumulated proportional values (Lorenz curve).

2. Research design

Literature studies revealed the existence of more than 100 indexes describing directly or indirectly the level of development of international enterprises (e.g. Brzozowski & Cucculelli, 2016; Bryl & Truskolaski, 2017; Rajnoha, Lesnikova & Krajcik, 2017).

First, a preliminary reduction of the number of indexes has been performed. In course of first stage of direct semi-structured interviews with business management practitioners a set of 18 most relevant indexes has been identified. The decrementation criteria were the following: (i) mathematical complexity – complicated equations difficult to apply for decision-makers without sophisticated mathematical knowledge or expensive computational tools; (ii) lack of data necessary for calculation or evaluation; (iii) time-consuming application; (iv) insufficient data from past time periods; (v) non-conformity with enterprise's field of activity. The preliminary decrementation of indicators of enterprise development resulted in the following set of indexes:

1. Product life cycle – for the purposes of the present study this index should be seen as percentage of company products in each of the stages of product life cycle (introduction, growth, maturity and decline). Gorchels (2000) states that "*a new product progresses through a sequence of stages from introduction to growth, maturity, and decline. This sequence is known as the product life cycle and is associated with changes in the marketing situation, thus impacting the marketing strategy and the marketing mix*".
2. Product diversification – this index shows the size of product portfolio of the given enterprise. Although in general opinion a wider range of products provides sales continuity in case when a product or a group of products stop bringing satisfying profits, Ramírez-Alesón & Espitia Escuer (2002) state that "*firms with intermediate levels of product diversification have the highest performance, while the firms with low and high levels of diversification show significantly lower performance, which performance is not significantly different between them*".

3. Flexibility – from the economic perspective this index shows the aptitude and reaction time of an enterprise towards the changes in its market environment. Innovativeness and technology development force companies to quickly adapt to new market trends.
4. Level of cash on bank account – enterprise's short-term financial liquidity. If used as an index, it should focus on constant analysis of capital inflows and outflows instead of checking its momentary levels. The supervision should include a trend check, i.e. seasonal peaks and shortages in account positions.
5. Innovativeness – This index represents the importance of innovations in strategy of the analysed company. An innovation is an idea that creates a measurable economic value. Any innovative activity has to be preceded by an "invention", which is not directly meant to bring profit in terms of money. However, an innovation should imply a possibility of providing income.
6. Capitalization – enterprise value based on equity price. Provides information on available capital levels for operational activities and further development.
7. Equity price – a tool for assessment of managerial efficiency, observed by shareholders to early identify alarming changes in enterprise's condition.
8. Number of clients – the analysis of portfolio of clients can provide some information on enterprise dependence on key contracts. Although a lower number of purchasers can enhance specialization towards their specific needs, a bigger number increases the level of enterprise independence and stability in times of recession or trouble on buyers' side.
9. Investment to income ratio – the percentage of funds reinvested into enterprise development. Reveals the approach of key stakeholders towards future development of the enterprise.
10. Level of income – general level of enterprise net profit after taxes.
11. Level of employment – number of people employed in the enterprise.
12. Structure of backlog of orders – popularity of particular products, directions of trade, size and type of clients, dominant payment methods and order volumes and other information relevant for the composition of portfolio of business partners.
13. Survival ratio – income to fixed costs ratio – index presenting the relation between costs that need to be covered on a regular basis (wages, leasing, office rent, administration, etc.). This index shows directly the minimal level of money needed yearly by the company to survive neither without creating liabilities nor realizing profits.
14. Parts Per Million (PPM) – ratio of complaints to faults in each million of produced parts. Used mainly in production companies.
15. Return on capital – measure of company efficiency in managing the money invested in its functioning.
16. Floating assets level – amount of accounts receivable, cash, inventor and outstanding shares. Generally, an index showing company aptitude of maintaining a proper development (sales) to working capital ratio, e.g. growing sales require higher stock levels, which require increase of financing

capabilities. An appropriate level of floating assets allows the company to operate without taking costly bank loans or instantaneous sales of assets to finance its regular operational activities.

17. Geographical range of activity – geographical coverage of company operations and market presence.
18. Operating profit – Earnings Before Interest and Taxes (EBIT) – measure of enterprise earning derived from its activities before deducting the payments of interest to stakeholders and income taxes to the government.

The chosen set of indexes contains both qualitative and quantitative indicators, as besides application of scientific tools for enhancement of decisions, managerial decision-making involves also activities based on experience and managerial routine. Additionally, it is important to understand, that simplicity of an economic index does not necessarily equal its low usefulness.

In the next step a Delphi questionnaire has been sent to the respondents. The composition of the research sample was based on following assumptions: (i) the respondents were active managers; (ii) the targeted companies were operating internationally; (iii) there was no differentiation in the provenience of company's capital (Polish or international). Additionally, in order to stratify the research sample three managerial levels (operational, tactical and strategic) were employed.

The questionnaire covered the following issues: region of operation of analysed companies; years of experience on the market; legal form; territorial coverage (regional, national, international, global); percentage of foreign capital involvement; number of employees and employment structure (size of employment, type of contract, language skills, education); income from local, regional, international and global markets; level of profit or loss in past time periods; willingness of using consulting services; which indexes describing the actual economic situation and short-term prospects of respondent's business are being used by company's management at times of crisis; how would their preference towards applied indexes change in a situation of economic prosperity. The core of presented research has been included in the last two questions. The questionnaire included also the question "*How would your answers differ if asked in times of different general economic situation*"?

The questionnaire, accompanied by an introduction letter, has been sent to more than 100 small and medium enterprises which resulted in 32 received answers (29 in electronic form, 3 on paper). The questionnaire return ratio level reaching nearly 30% seems quite high for this research method, which most probably came from preliminary telephonic announcement of questionnaire dispatch.

3. Results and discussion

Table 1 presents aggregated values of expert evaluations of usefulness of all preliminary chosen 18 indexes measuring the level of development of international companies. The "*No. of answers*" column represents the number of experts that

attributed highest ranks to a cumulated group of four indexes with highest "*Average rank*" (with attributed significance ranks 1-4). "% *of answers*" shows the percentage share of number of answers in a total of 100%. "*Cumulated No. of answers*" has been calculated by adding the current number of answers to preceding position from the same column with its percentage value marked in the last column – "*% of cumulated No. of answers*".

The findings show that although the responses varied following enterprise's field of operation, a general trend towards application of product-related indexes (product life cycle, structure of backlog of orders), innovation (innovativeness, investment / income ratio) and income level (equity price, return on capital) has been observed. For times of recession, the respondents declared a relatively low usefulness of such indexes as equity price, capitalization or innovativeness. Their usefulness has been perceived as higher in times of economic prosperity.

Also such indicators as the geographical range of activity and the number of clients attired respondents' attention. Interestingly, some respondents stated that their competitive advantage can be strengthened in times of recession.

Table 1. Aggregated values of expert evaluations for significance ranks 1-4

Expert evaluations			Significance rank: 1-4			
Rank	Measure of company's development	Average rank	No. of answers	% of answers	Cumulated No. of answers	% of cumulated No. of answers
1	Flexibility	4,47	18	15%	18	15%
2	Level of income	5,21	15	12%	33	27%
3	Number of clients	6,57	13	10%	46	37%
4	Survival ratio	5,89	12	10%	58	47%
>4	Operating profit	7,64	9	7%	67	54%
>4	Product diversification	7,52	9	7%	76	61%
>4	Structure of backlog of orders	7,82	9	7%	85	69%
>4	Level of cash on bank account	7,86	8	6%	93	75%
>4	Innovativeness	8,04	8	6%	101	81%
>4	Return on capital	8,48	9	7%	110	89%
>4	Floating assets level	7,79	6	5%	116	94%
>4	Equity price	12,86	3	2%	119	96%
>4	Product life cycle	12,24	2	2%	121	98%
>4	Geographical range of activity	11,31	1	1%	122	98%
>4	Parts Per Million	13,35	1	1%	123	99%
>4	Capitalization	13,73	1	1%	124	100%
>4	Level of Employment	11,76	0	0%	124	100%
>4	Investment / income ratio	12,28	0	0%	124	100%

Source: Gawlik, R., own elaboration based on research results.

Research outcome presented in Table 1 indicates that 47% of decisions made by managers of international enterprises can be made on basis of 22% of indexes only. This percentage represents 4 indexes out of 18 that in most expert evaluations obtained highest ranks (between 1 and 4). These were the following indexes: flexibility, level of income, number of clients and survival ratio. Fig. 1 shows the Pareto-Lorenz diagram, being the outcome of ABC method application and resulting from calculations presented in Table 1.

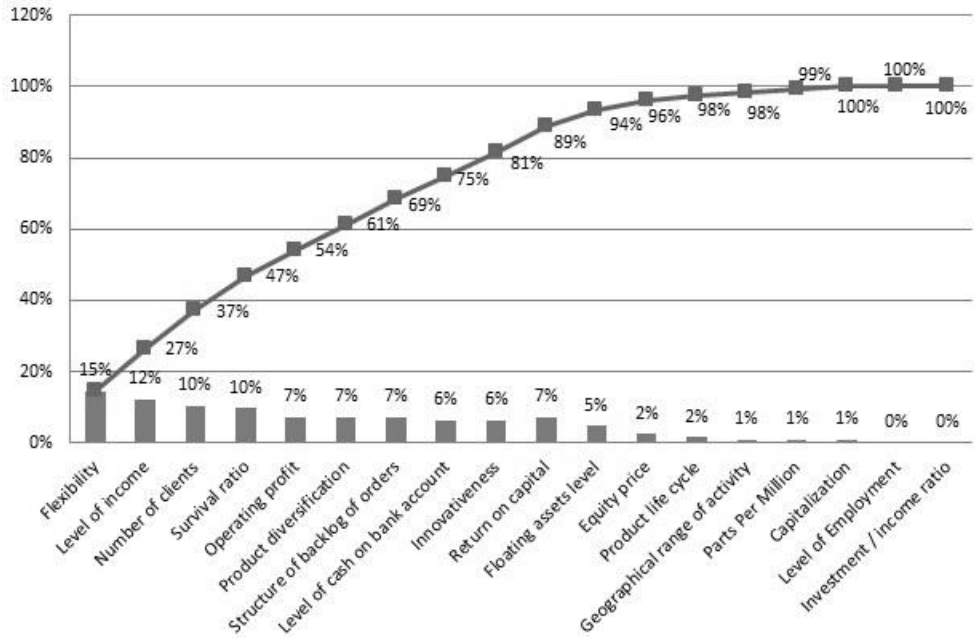

Fig. 1: Pareto-Lorenz diagram for aggregated values of expert evaluations for significance ranks 1-4.
Source: Gawlik, R., own elaboration based on research results.

Although the ratio of indexes that facilitate the decision-making (22%) is close to the value from Pareto-Lorenz method, the expected decision-making results ratio appears to be less satisfactory (47%). For this reason a second Pareto-Lorenz analysis has been performed, this time focusing separately on each measure. The expert evaluations of usefulness of examined indexes for each of the significance ranks from 1 to 4 have been presented in an aggregated form on Fig. 2.

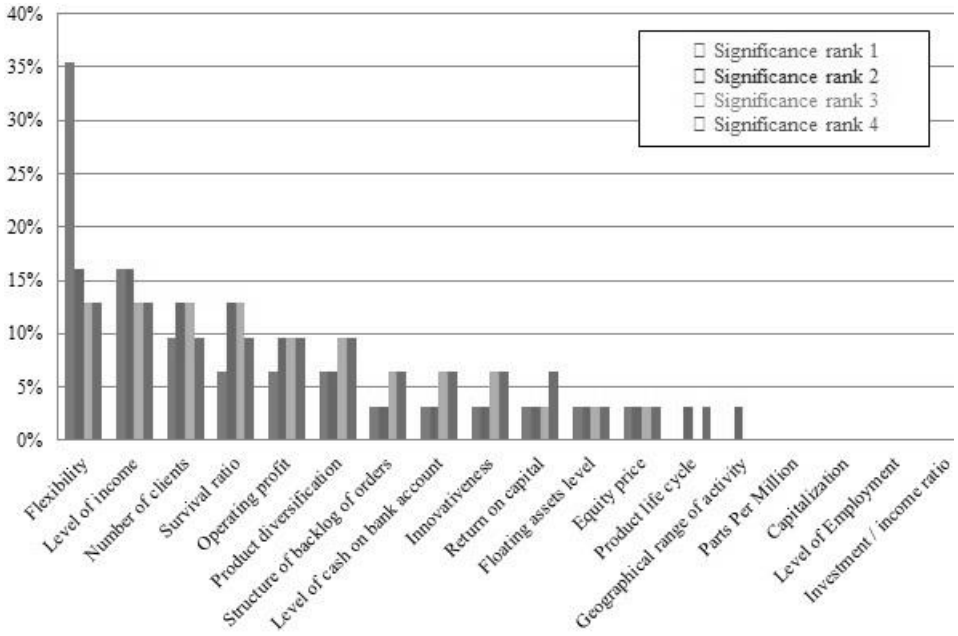

Fig. 2: Share of significance ranks 1, 2, 3, 4 assessed separately.
Source: Gawlik, R., own elaboration based on research results.

At this stage of research a representative group of experts agreed that between indexes describing the development level of their companies flexibility plays a crucial role (average percentage of votes above 20% for each significance rank from 1-4). Also level of income, number of clients and survival ratio were declared as relatively important, with an average percentage of votes above 10%. Indicators such as parts per million, capitalization, level of employment, investment to income ratio, geographical range of activity, product life cycle, equity price, floating assets level, return on capital, innovativeness, level of cash on bank account and structure of backlog of orders have been ranked as much less relevant, with an average percentage of votes lower than 5%. A small group of indexes with an average percentage of votes between 5% and 10% (operating profit and product diversification proved to have enough importance to attire decision-makers' attention, although their reliability has been graded as relatively low.

Conclusions

The synthesis of study results indicates that at this stage of research it is difficult to build one synthetic index of actual condition and development level of international companies. The analysis resulted in finding a group of indexes of universal usefulness, regardless of company's profile, such as flexibility, level of income, number of clients and survival ratio.

The direct outcome of presented research is a faster and more accurate managerial decision-making, which could be based on the proposed set of indexes when quick decisions need to be made. Nevertheless, relying on a long-term basis on such a limited choice of indexes would obscure company's development opportunities, which constitutes a serious limitation of discussed research. Another research limitation comes from choice of enterprises (they could be more specifically narrowed) and from respondents, as lower managerial levels have not been incorporated. Finally, the composition of the research sample does not allow broad generalizations, due to its insufficient representativeness. Therefore further research should focus on elaboration of a multicriteria decision-making model, which would allow to incorporate various types of indicators of company's development, including the qualitative and quantitative ones.

The practical research outcome is the enhancement of the speed and efficiency of managerial decision-making (as understood in Charnes, Cooper & Rhodes, 1978). This study also contributes to the increase of applicability of scientific tools for enhancement of managerial decision-making. Its added value comes from addressing the need of management practitioners for ease and rapidity of use of scientific decision-making methods.

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Streszczenie

Rangowanie wskaźników wydajności przedsiębiorstwa w menadżerskich procesach decyzyjnych przy użyciu metody delfickiej

Cel artykułu: analiza użyteczności wybranych ilościowych i jakościowych wskaźników kondycji przedsiębiorstwa dla celów podejmowania decyzji. Badana grupa: małe i średnie przedsiębiorstwa, z kapitałem polskim i zagranicznym, operujące lokalnie i międzynarodowo. Metody badawcze: (i) metoda Delficka – kwestionariusz dla zebrania danych ilościowych; (ii) dwuetapowe częściowo ustrukturyzowane wywiady eksperckie, w celu wstępnego ograniczenia liczby badanych wskaźników; (iii) metoda ABC (diagram Pareto-Lorenza) do prezentacji i interpretacji wyników badania. Wyniki: zestaw czterech wskaźników, na podstawie których można podejmować decyzje menadżerskie, jeżeli konieczna jest szybka decyzja: (i) elastyczność; (ii) poziom przychodów; (iii) liczba klientów; (iv) wskaźnik przetrwania. Implikacje praktyczne: szybszy i precyzyjniejszy wybór wskaźników do zastosowania w podstawowych decyzjach menadżerskich. Przyszłe badania: opracowanie wielokryterialnego ilościowo-jakościowego modelu wspierania procesów decyzyjnych. Ograniczenia badania: mało reprezentatywna grupa przedsiębiorstw (może zostać precyzyjniej zawężona) oraz respondentów. Wartość dodana: badanie stanowi przyczynek do wzrostu praktycznych zastosowań naukowych narzędzi wspierania menadżerskich procesów decyzyjnych.

Słowa kluczowe: kierownicze procesy decyzyjne, wskaźniki rozwoju przedsiębiorstw, zarządzanie, małe i średnie przedsiębiorstwa.
Klasyfikacja JEL: D81, C44, M21