Supporting the Diagnostic of Portuguese SME using AHP

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Abstract

• We suggest the use of the Analytic Hierarchy Process (AHP) to evaluate intervention measures in Portuguese Small Medium Enterprises (SMEs).

• These measures result from an external diagnostic performed under the QREN program ("Quadro de Referência Estratégico" – Strategic Reference Frame).

• QREN aims at the development of Portuguese economy and is financed by the European Union.
Abstract

• The AHP application enables to rank the intervention measures and to focus on the most promising ones.

• We present the results of applying the AHP over two cases.

• The results show that AHP adds consistency and focus to the interventions in the framework of QREN.
Context

• SMEs (with less than 100 employees) are the dominant type of companies within the Portuguese enterprise structure, sharing many types of problems.

• The QREN framework aims (among other objectives) at enhancing SMEs through:
  – the improvement of management quality,
  – the introduction of new organizational structures and technology,
  – the access to new markets and
  – the incorporation of social responsibility.
Context

• The idea is to follow an instruction-action attitude where (external) consultants develop their activity around the following vectors:
  – company diagnostic,
  – suggestion of intervention measures and training of companies’ collaborators (including entrepreneurs).
Diagnostic

• A diagnostic must encompass:
  – the characterization of both company and overall business;
  – the identification of objectives;
  – the analysis of the business context;
  – a SWOT (Strong points, Weak points, Opportunities, Threads) analysis;
  – a list of the current versus the desirable situation;
  – a hierarchical structure (a tree) of aims (objectives).
Strategic Plan

• Using the objective tree, consultants and management staff develop the intervention measures and define the instruction plan.

• By including the social responsibility component, a strategic plan of medium-long term is concluded.
AHP

• We suggested the use of the Analytic Hierarchy Process (AHP), as defined by Saaty, in order to evaluate the intervention measures according to the objective tree.
• This enables to rank the intervention measures and to focus on the most promising ones.
• As a byproduct of this evaluation, the consistency of the objective tree is also tested and the hierarchical structure of aims can be rebuilt in case of inconsistency.
Software

• When searching the internet to find suitable software for AHP implementation, we found a large amount of possibilities.

• We selected a small amount of implementations, ranging from simple Microsoft Excel templates to more sophisticated systems, and used them in SMEs diagnostic cases.
Software

• Two of them were specially preferred by the users:
  – a Microsoft Excel template (http://bpmsg.com/) and
  – the system “Make it Rational” (https://makeitrational.com/).

• The users are the consultants and the SMEs management staff responsible for the development of the SME diagnostic.
Case I – Printing Company

• This small company prints documents and other material for institutional communication and marketing.

• It has three main sections:
  – the accounting section;
  – the pre-printing section, where the materials are prepared to the printing machines; and
  – the production section, where the materials enter the machines to be printed.
Identified elements needing intervention

• disorganized billing process;
• printed and delivered works where not billed to customers, because the accounting section did not know about them;
• communication breaks between the pre-printing section and the production section;
• incorrect filling of the production forms;
• difficulties in finding technical information about previous works;
• urgent requests disrupted pre-printing section workflow, causing delays;
• there was a general feeling that the employees where not listen when problems arise;
• production employees where under motivated, as they felt that they work harder than the employees from the other section.
**Increase Revenues (100%)**

**Improve Billing (67%)**

<table>
<thead>
<tr>
<th></th>
<th>Improve Productivity (33%)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Production Effectiveness (20%)</td>
</tr>
<tr>
<td>IM-1 (50%)</td>
<td>IM-3 (7%)</td>
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<tr>
<td>IM-2 (17%)</td>
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</tbody>
</table>

IM-1: To re-design the billing process, possibly by introducing billing software;

IM-2: To introduce a better communication channel between production and accounting sections, in order to control deliveries and billing;

IM-3: To improve the communication channel between pre-printing and the production sections, in order to avoid breakdowns, thus reducing lead times;

IM-4: To emphasize the need for documenting the different works, preferably using digital documenting;

IM-5: To improve the archive system, by introducing a database management system;

IM-6: To avoid urgent requests;

IM-7: To improve internal communication;

IM-8: To find ways for employees’ acknowledgement.
Case II – Civil Engineering Company

• The main activities of this company consist on
  – the analysis, verification and validation of construction projects,
  – the management of construction contracting,
  – the inspection or management of constructions sites.

• The analysis of the company enabled to identify the current main objective:

  Raising operational results up to a positive level, as their numbers were in the red.
Issues requiring intervention

- difficulties in finding new contracts;
- due dates of some of the contracts in the current portfolio were expiring;
- employees felt difficulties in managing their individual time, especially on work overload;
- communication breakdowns from higher to lower hierarchy (though there were several meetings with clients, the employees were not aware of them neither of the resulting information);
- there were problems managing documents and archives;
- several employees reported difficulties in using office applications;
- there was not enough expertise inside the company to do internal quality audits;
- there was not enough expertise inside the company for fire security inspection (the company was sub-contracting other companies for this issue).
### Positive Operational Results (100%)

<table>
<thead>
<tr>
<th>Improve Sales Effectiveness (9%)</th>
<th>Improve Productivity (35%)</th>
<th>Reduce Costs (56%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM-1 (8%)</td>
<td>IM-2 (1%)</td>
<td>IM-6 (11%)</td>
</tr>
<tr>
<td>IM-3 (2%)</td>
<td>IM-4 (7%)</td>
<td>IM-7 (34%)</td>
</tr>
<tr>
<td>IM-5 (26%)</td>
<td></td>
<td>IM-8 (11%)</td>
</tr>
<tr>
<td>Reduce Unproductive Time (9%)</td>
<td></td>
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</tbody>
</table>

**IM-1**: To reinforce the sales team;

**IM-2**: To improve marketing strategies;

**IM-3**: To improve internal communication between management staff and employees through regular meetings;

**IM-4**: To improve the archives, by introducing a database management system;

**IM-5**: To teach employees about techniques for personal time management and office applications;

**IM-6**: To teach quality control techniques to employees;

**IM-7**: To contract experts on fire security systems and inspections;

**IM-8**: To reduce financing costs by changing short term debt to long term debt.
Conclusions

• The AHP application enabled to rank the intervention measures and to suggest focusing on the more promising.

• The presented cases are deemed enough to understand the advantages of the AHP use and also to start the assessment of which are recurring cases.
Future Work

• This observation enabled us to start the design of an information system for helping on SMEs diagnostic process.
• By documenting several cases, it is possible to select groups and sub-groups of intervention measures along with groups and sub-groups of issues that require intervention.

• The general idea is to build an interactive web application where managers could have access to SMEs cases and related extracted information. In this way, managers (without the help of hired consultants) can choose the intervention measures that better fits their particular case.