"Future classification systems - requirement specification from a management perspective"

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The purpose(s) of classification systems in a slaughterhouse and consequently the technical capabilities of an 'ideal' classification technology are being defined differently by different disciplines. Thus a gap exists between the requirements that seem to be essential from a meat science point of view and those that are indispensable from a management point of view. To overcome this situation, this paper will try to present an integrating view and thus a framework for the discussion of a future 'ideal' classification technology. The requirement specification of a suited technology will be developped in close connection with the marketing, production and procurement strategy and with the general firm strategy, respectively.

1.0 The firm strategy, departmental strategies and their impact on an 'ideal' classification technology

It is generally accepted that in the competitive environment in which the slaughter industry has to operate, only those firms will be successful that have a 'clear vision' of their future and that realign all departmental strategies in concert with the main strategy (Bishop (1), Madsen et al (2)).
FIG. 1 (compare too (3)) illustrates that the firm strategy should generally aim at supporting the management by enabling cost benefit analysises (in all critical decision areas). To reach this goal, a management must be able to set up a basic cost accounting system (direct or activity based costing system), for which the availability of the exact material balance of the slaughter process (for each and every single animal and thus for the production in total) and subsequent processes is essential. Thus one key question for management in a slaughterhouse is how - by which technology - it can generate this indispensable material balance (see to Lorenz (4), (5)).
In addition, the general firm strategy must integrate the substrategies in the marketing, production and procurement sector under due consideration of the limited financial, R & D and personell resources. In this paper mainly the integration of the marketing, production and procurement strategy will be stressed and the requirement specification of 'ideal' classification systems be derived. To reach such an integration, a management has to control that any new technology entering the slaughterhouse will be in compliance to the overall firm strategy and the departmental strategies.

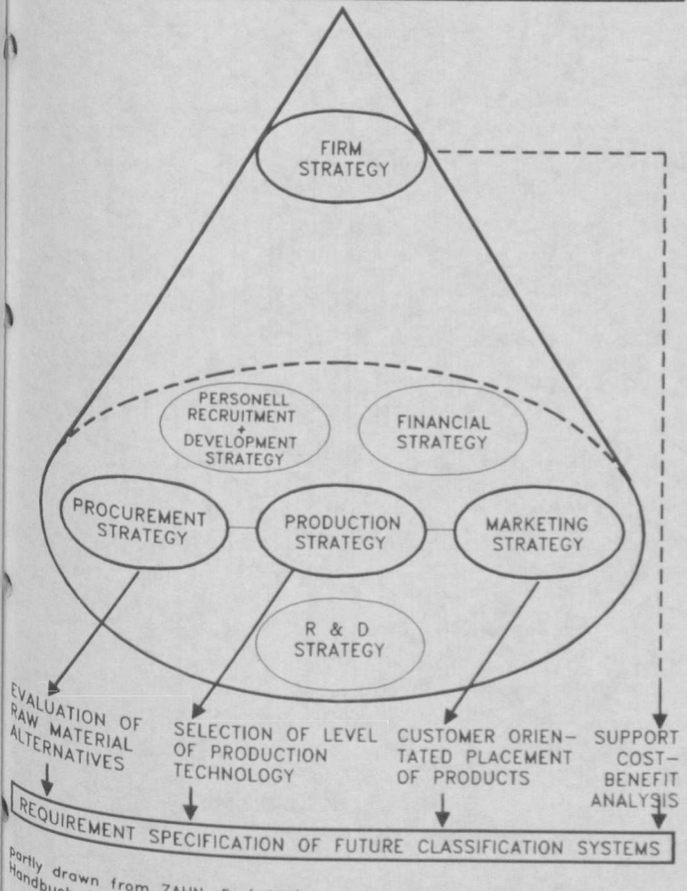
2.0 Analysis of the requirement specification of classification systems at critical interfaces

A complete picture of the necessary functions of an 'ideal' classification and production technology can be drawn by looking at it's interfaces and the information that there must be available for other departments/customers in compliance with their strategies.

2.1 The interface between classification systems and the final product market

The surplus of meat in the EEC (and elsewhere) has led to a situation where only those firms can operate successfully which are able to produce meats tailored to the specific needs of individual customers and to allways garantee delivery in the right amount and at the right

FIG. 1: SECURING SUCCESS BY STRATEGIC CONTROLLING



Partly drawn from ZAHN, E. (1988): Produktionsstrategie, in: HENZLER, H.A.: Handbuch Strategische Führung, Wiesbaden 1988

FIG. 2: PORK CATOLOGUE FOR PRIMAL PARTS PRODUCTS AND WEIGHT RANGE TABLE

ARTICLE NO.	PRODUCT	PAGE NO.	RANGE A	RANGE B	RANGE C
400	CARCASS	99	60 - 75 kg	75 - 90 kg	90 - 105 kg
401	HAM, REGULAR	100	5 - 7 kg	7 -9 kg	9 -11 kg
403	SHOULDER	101	4 - 6 kg	6 -8 kg	8 -10 kg
408	BELLY	103	5 - 6 kg	6 -7 kg	7 - 8 kg
410	LOIN	104	5,5- 7 kg	7 - 8,5 kg	8,5- 10 kg
418	TRIMMINGS PII 90 % LEAN	108	Amount as specified		
420	TRIMMINGS PIII 80 % LEAN	109	Amount as specified		

PRIMARY KEY FOR SORTING PROCESSES (IN THE US):
→ **WEIGHT OF THE PRODUCTS** !!!
ADVANTAGES: 1. CUSTOMER RELATED SORTING PROCESS
2. AVAILABILITY OF ANIMAL SPECIFIC CUT-OUT

compare too:
"Meat buyers Guide"-Editor: National Association of Meat Purveyors (NAMP)

FIG. 3: PORK-CATALOGUE FOR TABLE-READY CUTS

ARTICLE NO.	PRODUCT	SPECIFICATION SEE PAGE NO.	PORTION SIZE				
			80g	110g	140g	170g	200g
1800	FILETS	211	X	X	X	X	
1806	BOSTON BUTT STEAKS	212	.	X	X	X	X
1807	SHOULDER BUTT STEAKS	213	.	.	X	X	X
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
1898	GROUND PORK	287	according to specification				

KEY FOR SORTING PROCESS: PORTION WEIGHT
ADVANTAGE: BASIS FOR MENU PLANNING

compare too: Meat Buyer's Guide; Editor: National Association of Meat Purveyors (NAMP)

time at a competitive price.
Thus not only the customer's quality requirements (such as freshness, absence of residues), a suited hygenic production technology but too the time that elapses between customer order and delivery become critical. This time is directly dependant on the performance of a management's planning processes. Technologies (to be newly) implemented in a slaughterhouse therefore should be analysed whether they are supporting these planning processes in the best possible way or not. Additionally the classification technology(ies) has to be set up in compliance with the manifold requirements of all other departments and/or customers.
Since a firm cannot exist without customers, it is essential to analyse the needs of specific customers in detail and then to go back and develop and implement a suited technology.
At the time being, meat is traded on specifications that are explained in (firm specific) catalogues or meat buyer guides ((6), (7), (8)).
FIG. 2 gives an example for primal parts which can be ordered within a primal part specific weight range.
FIG. 3 advises the HRI sector how to order table-ready cuts in different portion cuts.

2.2 Translation of customer requirements in classification/production technology

To garantee such customer specifications, which mostly concern the weight, the production technology of the slaughter firm must be designed adequately.
An example for a suited production process (in the US and in some EEC-countries) which combines weighing and sorting of primals is shown in FIG. 4. Directly after primal part dissection, the primals are boxed and the animal no., slaughter no. and other relevant slaughter data are being transfered to a magnetic R/W-chip-card which is attachted to each of the boxes.
The exact box weight has been chequed at a preceeding station of the box conveyor system. The box and its content are identified and weighed and the weight is added to the data on the chip card. Based on predetermined (firm or customer) standards the primals are sorted by weight to different conveyors by a target control. Primals sorted according to these weight groups are sold fresh or are processed further in specific production lines. As this process is very simple and quick it is especially suited for high volume production (under a firm strategy emphasizing cost reduction). Additionally this process has the advantage that besides the ability of sorting primals to customer specific weight groups, the problem of identification of primals and the generation of animal/carcass specific cut-out data is solved in a practical way.
An obvious disadvantage of such a process is that if sorting to additional customer specific quality data is required, the process is boosted by the necessity to add an extra switch in each line for each new quality parameter to be introduced. These quality parameters off course would have to be supplied by adequate techniques in the preceeding slaughter process. The danish KC center for pigs drafted in FIG. 5 today is one of the most advanced technologies in this respect.
A detailed description of this technology which is considered as the key element of the CIM strategy of the danish meat sector is given by Verwohlt und Thrane (10) and by Madsen et al (2). The system is capable of classifying both, the complete carcass and the major cuts and is automatically branding the EC health certificates and grade marks. The grade assignment for the primals is based on optical probe measurements, which produce the basic data to calculate thicknesses and meat contents. This information is used intensively for the decission making in the subsequent production departments as well as in the overall material balance planning system.

FIG. 4: COMBINED WEIGHING AND SORTING PROCESS FOR PRIMALS

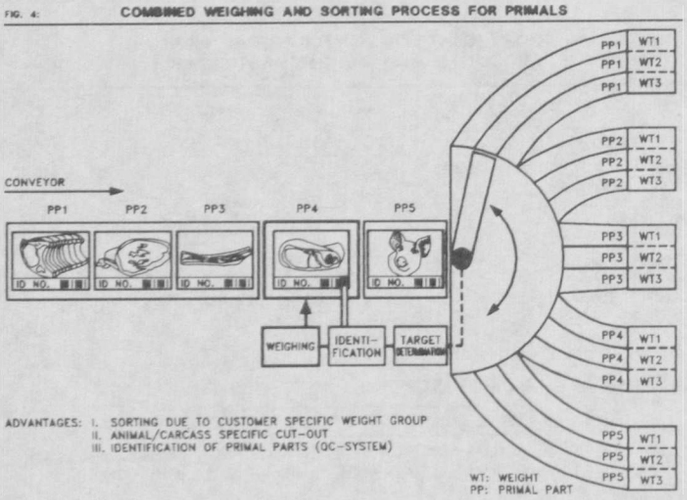
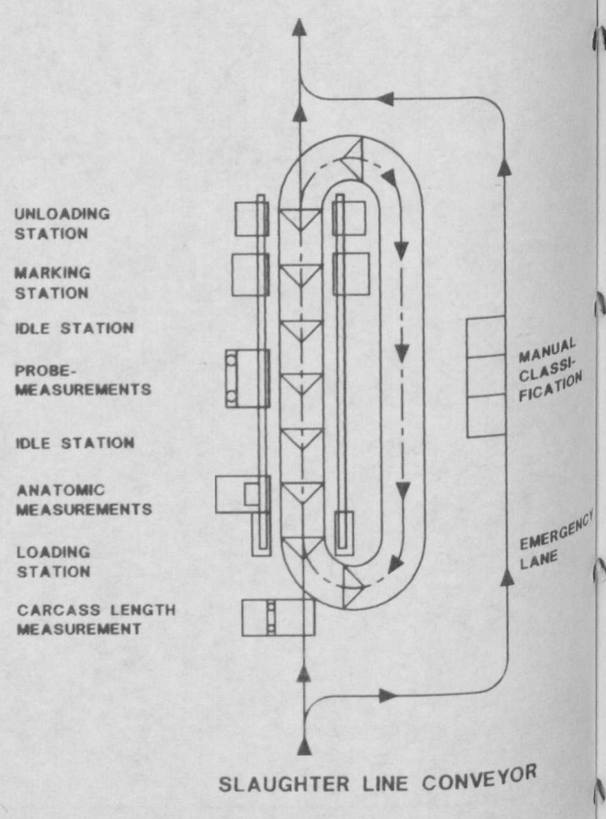


FIG. 5: KC-CLASSIFICATION UNIT
DESIGN AND FUNCTION OF THE KC



Source: (10)

FIG. 6:
CUSTOMER ORIENTATION: IN A MARKET ECONOMY THE CUSTOMER IS "KING"
→ CUSTOMER REQUIREMENTS MUST BE MET

GROUP OF CUSTOMER	RAW MATERIAL	ARTICLE NO.	REQUIRED SPECIFICATION: WEIGHT	pH_1	FATNESS	OTHER SPECIFICATIONS
e.g. PARMA HAM PRODUCER	HAM	xxx	> 13,5 kg	> 5,8	MAX 1 CM FAT LAYER	"RESIDUE FREE"
e.g. HRI	CUTLET "SCHNITZEL"	xxx	150,165,180 g	> 5,8	MAX 8 MM FAT LAYER	dto.
	STEAK	xxx	140,160,180 g	> 5,8	NO VISIBLE FAT	dto.
		xxx	160,180,200 g	> 5,8	NO VISIBLE FAT	dto.

USA: Automated weighing and sorting processes
DK: KC-Center (multi criteria specification of primal parts/carcasses)
DK: BLOOD-ANALYSER FOR SCANNING RESIDUES
TRANSLATION INTO TECHNOLOGY
WEIGHT SPECIFIC SORTING
pH_1-VALUE SPECIFIC SORTING
SORTING DUE TO FATNESS
OTHER SORTING CRITERIA

The KC too contains two idle stations which serve as retrofit for future applications such as measurement of intrinsic muscle colour or determination of the protein content.

An even more specified market/customer orientated way to define a suited production, sorting or classification technology would be the approach outlined in FIG. 6.

Starting with customer grouping by specific products, the raw material specification for each customer for a reliable production of quality products should be developped. In case of e.g. a parma ham producer this specification could be as follows:

The weight of a ham should be in the range of 13.5 kg or higher, the pH_1 should be greater than 5.8, the fat layer should not exceed 10 mm and the raw material should qualify as 'residue free'.

For all customers and procucts similar specifications have to be developped and thus the basic capabilities of suited classification (or sorting) technologies have to be defined. Accepting the above mentioned standards of a (parma ham) customer has as a consequence that in the slaughterhouse technologies must be implemented that achieve sorting due to weight, pH_1-value, fatness and/or other relevant customer critera. In Denmark e.g., the claim for 'absence of residues' in meat logically led to the project of developping a blood analyzer which will be integrated in the slaughter and sorting process.

As far as the customer interface is concerned, the 'ideal' classification technology consists of a 'bundle of techniques' that primarily describe the (customer defined quality) parameters of the product - be it carcasses, primals or subprimals - and that are capable of sorting the products to exactly meet customer specifications.

At a first glance, a mix (line operation) of the danish KC technology (FIG. 5) and automated sorting processes (FIG. 4) seems to be one feasible solution as far as the 'ideal' customer interface and its sorting requirements are concerned. Nonetheless it must be considered that both existing technologies have been developped under different main strategies.

The danish main strategy has been based on quality (Madsen (2)) and meat production in compliance with customer specifications, whereas the (mainly US american) strategy is primarily based on high volume production and cost effectiveness.

A slaughter capacity of more than 1.000 hogs per hour e.g. is typical and thus mandatory in the US, on the other hand the actual capacity of the danish KC-center is about 360 hogs per hour so that for a combination of both technologies three KC centers would be needed.

The space requirements especially for the sorting process (and subsequent buffers) in case that several quality criteria have to be met, makes this 'logical combination' less attractive. So there is still a need for even better solutions with possibly a completly different technology. However, all future solutions will have in common that they will have to be mainly customer orientated.

2.3 The interface between classification systems and management information systems

The main (slaughterhouse) strategy - to maximise profits - can only be persued if a management has access to a tailormade cost accounting and management information system, which gives support in all mayor decision areas. These critical areas are primarily the evaluation of (final product market price and slaughter cost based) pay-out-prices (Lorenz (11)) and the selection of raw material for optimal use (Madsen (2)). The structure of such a cost accounting system has been described in detail (Lorenz (4), (5)).

Basic constituents of such a managerial accounting and planning system are the material balance (and other input-output-factor balances) as well as the respective prices.

FIG. 7:

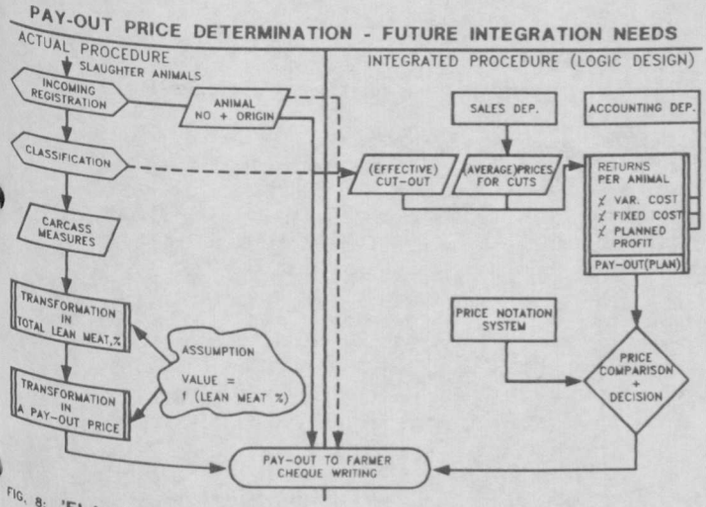
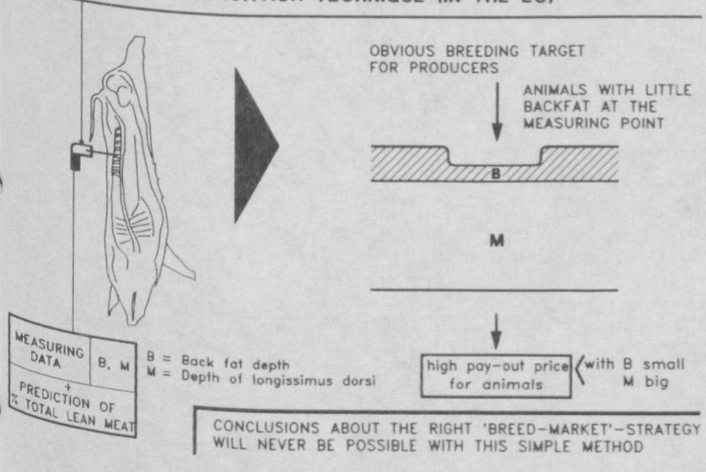


FIG. 8: 'FLASHLIGHT PICTURE' OF THE ACTUAL SINGLE PROBE CLASSIFICATION TECHNIQUE (IN THE EC)



A mayor obstacle for a slaughterhouse management in achieving such a modern direct costing or activity based cost accounting system lies in the fact, that at the time of cheque writing for the raw material (in connection with the classification station) the exact material balance for the animal/carcass normally is not available. Thus, instead of relating the pay-out price for an animal to the exspected returns (reduced by the cost of slaughtering and by a (planned) profit), in the EC, the cheque writing procedure is mainly based on a (single) probe measurement which is 'translated' into an estimated total lean meat percentage.

Thus the pay-out-function in the actual systems in Germany and other EC-countries is a linear function of the predicted 'total lean meat percentage' which additionally can be corrected for different carcass weight groups.

For accountants it is obvious that the actual procedure of pay-out-price evaluation is logically incompatible with the requirements that are imposed by modern management accounting and planning systems. For a detailed discussion and proof see Lorenz (5), (11), Müller-Merbach (12). A short-cut explanation of this incompatability is contained in FIG. 7, which on the left hand side describes the actual pay-out-price evaluation based on assumptions, whereas a management should apply a fact based procedure as outlined on the right hand side.

From a management point of view the non-availability of the (animal specific!) cut-out and consequently of the total material balance at an early stage of the production process does not only hinder setting up meaningful accounting systems (they are indeed a rarity in the slaughter business), in addition, all planning processes, e.g. coordination of the actual sales with the actual production (of carcasses, primals and subprimals) are lacking of detail and thus are not reliable, often they are thus not even undertaken.

In contrast to this average situation, the danish KC primal part classification center (widely) provides the input for a sophisticated material balance planning system. Such a material balance planning system is a must, if coordination of the sales, production and procurement department is to be organised for a prompt reaction to market chances.

The importance of a working material balance planning system in slaughterhouses is often underestimated, but once it has been installed it too reduces the average throughput time and the stocks in production buffers, which has a positive effect on the profitability of the shareholder captial. Moreover a reduced throughput time leads to a longer shelf life and thus to a minimum of returned products.
Thus, from a management point of view classification technologies should be developped, that directly generate the input data for the material balance planning and management information system (Lorenz (5)).
Available ultrasound, nuclear magnetic resonance and video image analysis techniques should be analysed and adapted mainly in this respect.

2.4 The requirement specification at the interface between the classification technology and the animal production sector

Besides a fair price (determined by a suited pay-out-price evaluation procedure), the producer exspects information that enables him to optimise his production decisions.
These production decisions mainly concern the optimal turnover in his stable - determined by the weight of the animals to be slaughtered -, the feeding regime which has an influence on the fatness, as well as the primary decision about what breed to select (Lorenz (13)). From a producer (and slaughterhouse) point of view, an 'ideal' classification technology must be designed in a way to directly support these basic producer decisions.
As different breeds show a different distribution of primals as well as differences in their quality parameters, they represent a different final product market value. The possible pay-out-price which is dependant on the final product market value thus is logically too a function of these variations. Suited classification systems therefore must especially be designed to point out the weight, quality and subsequent value differences of alternative breeds.
Joint producer/processor activities to determine an optimal breed-market-strategy which maximises total sector profits can only be set up, if the primal part specific differences between breeds are clearly identifiable by information generated by a tailormade classification system.
A 'flashlight' view (FIG. 8) of the single (!) probe measurements commonly applied in EC-countries (except DK) reveals, that this technique efficiently prevents that these indispensable (value) differences between different breeds are made transparent, as only one specific spot of the animal/carcass is being examined.
Thus this technique does not help in selecting profitable breeds nor does is help identifying the optimal slaughter weight. Moreover it is a system that obviously demands from the producer to deliver an animal/carcass that - in the area where the measurement is taking place - has a minimal fat layer, all other traits of the carcass are seemingly of no interest.
Besides the fact, that the producer side can hardly exspect support in making the right production decisions, this single probe technique too does not help a slaughterhouse management in setting up the animal specific material balance, which has been identified as a prerequisite for any meaninful management information system (Lorenz (5)).

2.5 Conclusions

An examination of the information requirements of different internal and external customers at their interface to the classification technology revealed central shortcommings of existing (especially single probe) systems.
An 'ideal' classification technology at least has to meet the basic information requirements of the marketing, production, procurement and management departments as drafted in this paper. Since these information requirements are mainfold, an 'ideal' classification technology consists of a 'bundle of techniques' which all fulfill very specific tasks. These tasks have to be clearly defined and they must be integratable under the selected firm strategy. Existing and future classification systems can be evaluated by analysing how well they support the choosen firm and departmental strategies, Further work will be necessary to define and analyse different firm strategies as well as their technological equivalent in detail. Morphological grid and other evaluation techniques should be used to identify the most suited technique for a specific task or strategy.

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