INTEGRATED MANUFACTURING-SERVICES BUSINESSES IN THE AUSTRALIAN BUILDING AND CONSTRUCTION SECTOR

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INTRODUCTION

The focus of this paper has been prompted by:

- emphasis in the 'knowledge-economy' literature on the increasing role played by services in economic growth; and
- recent analysis which suggests that the most dynamic sector of many economies is an *integrated* manufacturing-services sector.

The paper initially describes the emergence of an integrated manufacturing-services sector in the context of increasingly knowledge-based economic systems. It then reports on the results of a survey of manufacturers in the Australian building and construction (B&C) sector, investigating their involvement in service provision. The survey covers manufacturers of materials, products, equipment and machinery used on building and construction projects.

The survey investigates the:

- nature of services offered
- growth of service provision
- role of service-provision in overseas work
- influence of contract type on value-adding opportunities through service provision
- marketing of services.

The findings reveal the nature of service provision by manufacturers in the Australian B&C sector. It appears that the 'bundling' of products and services by these manufacturers is a key competitive strategy yielding significant benefits for them and the sector as a whole.

THE NEW ECONOMY AND SERVICE-ENHANCED PRODUCTS

This section briefly overviews the emergence of new economic systems and discusses the role of services and service-enhancement of products in the context of these systems.

Increasing competitive pressures internationally and the influence of technology in creating new production systems and outputs have combined to give rise to a new type of economic system – a learning intensive system, known as a 'knowledge-economy'.

The notion that modern economies can usefully be depicted as knowledge-economies has become well established over the past decade. The knowledge-economy perspective has been disseminated to a wide audience in publications as diverse as the *Beijing Review* (e.g. Liu 1999: 6), the *California Management Review* (eg 1998, Vol. 40, No. 3), *Nature* (e.g. Masood 1998: 714) and the *OECD Observer* (e.g. Drake 1998: 24).

Knowledge-economies have evolved away from the production of physical output as the primary source of value and employment, towards service activity as a key driver of growth. Indeed many analysts have drawn attention to the shrinking size of the manufacturing sector compared to the services sector as a proportion of GDP across OECD countries over recent decades (e.g. Marceau et al., 1997: 7.6).

This data has led some commentators to conclude that manufacturing activity has become less important to economic growth (e.g. Carson, 1998; Garcia-Mila and McGuire, 1998; Coyle, 1997). However, recent research suggests that this may not be true, instead it appears that much of the growth in services is directly dependent on manufacturing activity. The research concludes that unsophisticated interpretation of data leads to a picture of change that:

> ...conceals as least as much as it reveals. In particular, it obscures the increasing complexity of the linkages between service activities and goods-producing activities (Pappas and Sheehan, 1998: 131).

Indeed the complexity of such linkages was reflected in research conducted for the present paper, which was complicated by the difficulties that survey respondents had in separating out their service offerings from their products. This was particularly so in relation to design and engineering services. For customised output, such services can be considered part of the manufacturing process that make the product saleable. Similarly, for any given sale there is likely to be an embodied R&D service component, a marketing service component and so on.

Based on quantitative data, Pappas and Sheehan argue that one of the most rapidly growing segments in knowledge-based economies is an integrated manufacturing-services sector, defined as 'the complex of production and service activities involved in the creation, production, and distribution of manufactured goods' (Pappas and Sheehan, 1998: 131).

Manufacturing has always involved service activities, particularly in areas such as accounting, scheduling, client service and so on. However, the increasing complexity of manufacturing output has increased service intensity in areas such as research and development, design, and engineering. Further, trends towards increasing customisation of output also increase service intensity (especially for design services), as do demands from customers to supply total packages. Such packages often involve transportation of output to construction sites, installation of output and project management.

Based on research undertaken by the US National Research Council (1994) and Quinn (1992), Pappas and Sheehan (1998: 132) conclude that service *inputs*:

> ...such as accounting, scheduling, design, quality control, planning, marketing and research and development, are central to the goods-producing sectors, and on some estimates provide 60–75% of the input costs of modern manufacturing firms.

Of course, manufacturers also provide service *outputs*. These can take many forms depending on the nature of the firm. Some more common services provided by manufacturers include:

> ...planning, [installation], technical support, environmental analysis, design and engineering, systems integration, economic assessments, procurement advice, legal advice, teaching and training, and facilities management and operations support (Gann and Salter, 1998: 442).

Note that some services can manifest as either service inputs or outputs. For example, planning can be undertaken to assist a manufacturer's internal operations, and/or planning services can be provided to assist a manufacturer's clients.

Gann and Salter (1998: 1) suggest we are witnessing a new era in which 'the distinction between delivery of products and services has become blurred'. New services offered by manufacturers have been driven by changing demand patterns. Buyers of manufactured goods increasingly want more than the good itself — they might want finance options to buy it, transportation to move it, insurance to protect it, expertise to install it, landscaping to enhance its appearance, advice on how to maximise returns from it and/or expertise to manage it. Hence manufacturers are increasingly 'bundling' products and services to offer clients enhanced performance and improved value. Indeed, in many instances 'firm competences in adding services to the original physical project are the major enticement for the production of the artefact itself' (Gann and Salter, 1998: 436).

Gann and Salter report that, in the US, improved productivity performance has been linked to the effective bundling of products with a wide range of services in order to solve 'tangible physical problems' (Lester, 1998, in Gann and Salter, 1998: 433). This may be achieved by the application of R&D, engineering or design services to reconfigure output, or, for example, changes in weight or endurance properties.

Gann and Salter also suggest that service-enhanced products are particularly important for project-based firms, such as those operating in the building and construction industries. For many project-based firms, 'services are increasingly necessary to ensure that sophisticated component systems can be designed, integrated and operated as final complex products' (Gann and Salter, 1998: 439).

A *project* is a significant undertaking rather than a relatively simple matter of supplying output to a distributor. Therefore a greater range of more sophisticated services will be necessary to execute a project. Supply to a distributor implies a relatively standardised product typically requiring no specialised engineering or design input. Also, supply to distribution channels will not involve any project-based services such as installation (possibly including plumbing services, electrical services and so on), landscaping or project management.

In the Australian context, Pappas and Sheehan (1998) present a convincing case showing the existence of an integrated manufacturing-services sector. Their approach relies primarily on input-output data and employment data to demonstrate 'clear evidence of the increasing service intensity of Australian manufacturing' (Pappas and Sheehan 1998: 141).

The input-output data they present indicates that Australia's manufacturing sector draws heavily on purchases from service firms in industries such as transportation, communication services, finance, insurance, property services, and building services. This consumption of service inputs has increased rapidly since the late 1970s (Pappas and Sheehan, 1998: 9–13).

Further, Pappas and Sheehan (1998: 13–14) present evidence to suggest that this growth is not simply the result of increased outsourcing by manufacturers (which would simply shift the source of services provided from within the firm to external parties, rather than increasing the value of services consumed) but the result of increased service intensity in manufacturing operations. They rely on employment data showing a pronounced shift in the occupational distribution of employment within the manufacturing sector in reaching this conclusion. Their data indicate that since the late 1970s the proportion of total manufacturing employment accounted for by service occupations has shown strong growth.

The research undertaken for this paper rounds out this picture, primarily by extending analysis of the provision of services by manufacturers. The current project also produces useful industry-level insights through its examination of the B&C sector.

SERVICES PROVIDED BY MANUFACTURERS IN THE AUSTRALIAN BUILDING AND CONSTRUCTION SECTOR

The remainder of the paper is based on a survey of 18 leading manufacturers in the Australian B&C sector. These manufacturers collectively dominate their industry. The survey was based on a questionnaire administered by phone interview. The questionnaire sought to determine the nature and growth of services offered and the scope for service enhancement.

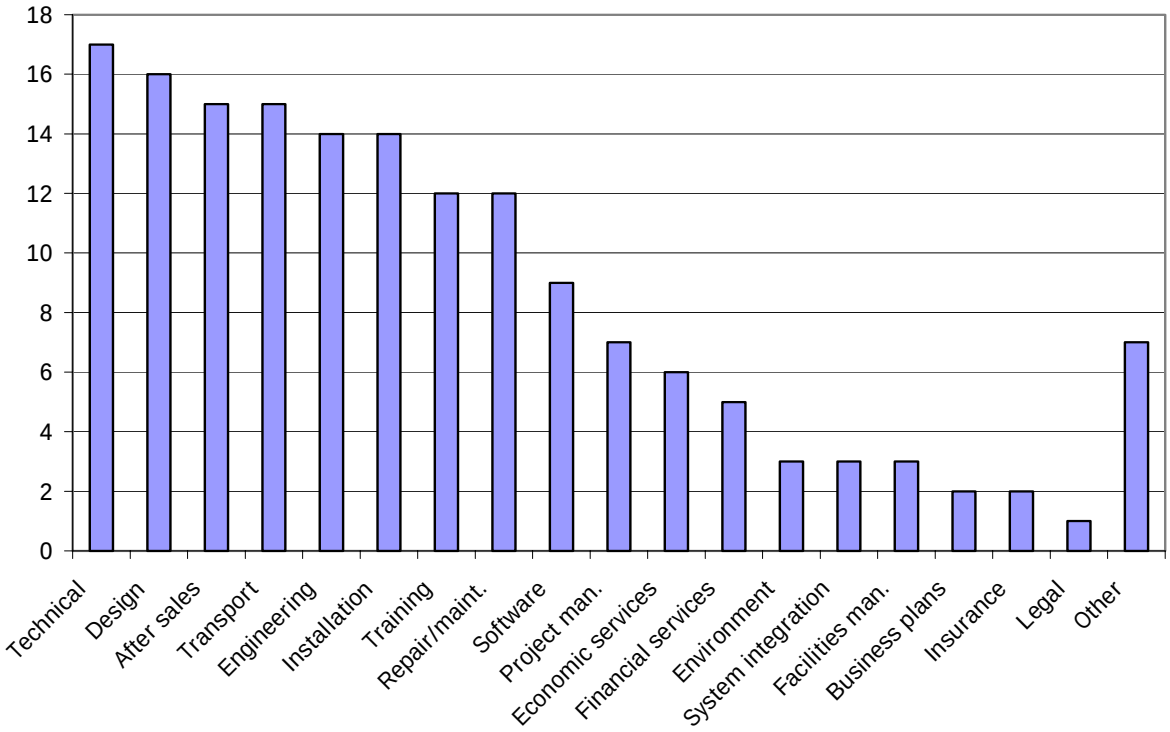
Sample businesses were selected from leading manufacturers. Hence, compared with the total population of manufacturers supplying the B&C sector, the manufacturers surveyed here can be expected to be at the forefront of the trend toward value-adding via the provision of services.

Thirteen of the 18 respondents were material/product suppliers, while five were machinery/equipment suppliers. Eight of the 18 respondents sold at least half of their output through direct project-based work, while 15 sold at least 20% of their output through direct project-based work. Hence, given findings in the literature concerning the importance of service-enhancement to project-based businesses (reported in the previous section), we would expect this sample to be actively involved in such enhancement.

Nature and growth of services

Technical service was the most common service provided by manufacturers, undertaken by 17 of the 18 respondents, as shown in Figure 1. Such services primarily involved providing clients with information regarding the characteristics of the material, product, machinery or equipment supplied. This included, for example, the provision of advice regarding strength, durability, weight, operation, systems integration and installation, for example. *Technical service* was probably the most common service provided because a large number of different types of services could be considered technical services (including design, maintenance or training).

Figure 1: Nature of services provided to clients, by number of businesses



Economic services refers primarily to the provision of comparative prices to potential clients; *business plans* refers to help with business plans for small clients; *project man*. refers to project management; *financial services* include the provision of payment options, such as extended credit.

Design services were the second most common service provided. This is a more specific type of service and is the most important single service (given the broad interpretation of *technical services* by respondents). This finding is likely to be related to the increasing sophistication and customisation of manufactured input into B&C activity.

After-sales services were the equal-third most common service offered. The survey question specifically related to 'after-sales service *provided by dedicated personnel*', rather than being more general. The three manufacturers that did not have any employees *devoted* to after-sales service may have still provided such service, though in a more general way.

*Transport service*s were the other equal-third most common service provided. Most manufacturers would arrange transport of their output to their clients. However, it is interesting that manufacturers were marginally more likely to provide design services than transport services. Perhaps the higher value of design work explains this finding.

Engineering and *installation services* were the equal fourth most common services offered. Engineering services were closely associated with design and installation activity. The provision of installation services is very significant for it largely determines whether or not a manufacturer is directly active on construction sites and hence impacts of the scope to add value via the provision of project-based services. Although installation is a key route to on-site work, other linkages to site-work are possible; for example, a steel manufacturer may not be involved in fabrication or installation of steel products, but may have significant design, engineering or project management expertise applied to on-site work. Interviews associated with the survey suggest that leading manufacturers are both very likely to be engaged in on-site (project) work *and* very likely to rely on such work as a major source of revenue.

Three other types of service were provided by at least half of the businesses surveyed.

These were training/teaching, repair/ maintenance and software services. Unstructured discussions with respondents revealed the following regarding the remaining services shown in Figure 1:

- *Project management* and *systems integration services* appeared to be high value, strategically important services, is discussed later in this paper
- *Facility management services* appeared to be strategically significant in view of growing client demand for increasingly comprehensive 'total packages'
- *Business plan services* comprised planning help primarily for small businesses
- *Economic services* often involved the provision of comparative prices to potential clients
- *Financial services* tended to comprise the provision of payment options to potential clients.

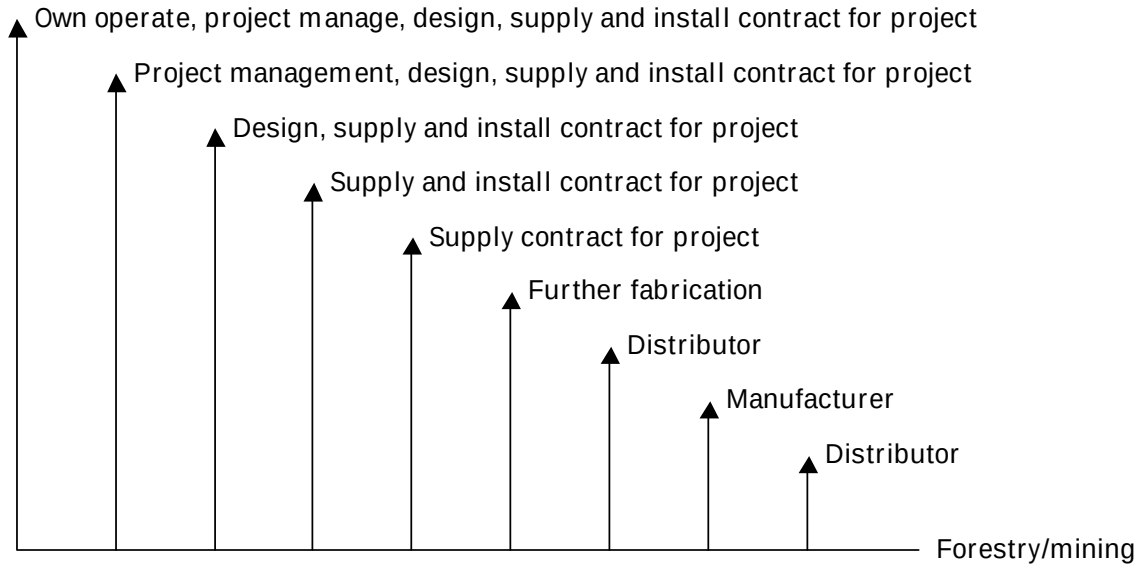
The *other services* category contained a range of services including testing services, modernisation services (e.g. upgrading lifts), distribution services, landscaping services, colour consultancy and site security services.

Discussions with survey respondents revealed that the ability of a manufacturer to add value to its operations via the provision of services is related to its role in the supply chain. Figure 2 presents a summary of the different ways in which manufacturers can be related to project work. As noted earlier, the significance of a close relationship to project work is that it gives manufacturers much greater scope to add value to their operations by the provision of services.

Project work primarily involves work carried out on a construction site, but it also includes site-related work such as product supply, transport services and the components of design/engineering/software services provided off-site. Hence, manufacturers may respond to project-based demands without actively being present on-site.

Non-project activity typically comprises sales through distribution outlets. Examples of services often provided to distributors, or to back-up distributor sales, include finance services, after-sales service and business advisory services. Project work can involve any of the following additional services: transport, installation, earth-moving, landscaping, plumbing, electrical, design, project management and facilities management. Installation tends to be the 'entry level' service to on-site work.

Figure 2: Supply-chain value-adding possibilities for manufacturers in the B&C sector



In terms of Figure 2 the least involvement a manufacturer could have in the B&C sector would be purchasing raw materials from an unrelated distributor, and selling manufactured output to an unrelated distributor. None of the survey respondents fell into this category.

The two respondents with zero tender-based sales had no involvement in project work. They both had involvement in down-stream activity and sold their manufactured output to an unrelated organisation that undertook further fabrication. The fabricator was then in a position to bid on project-based contracts.

For example, a glass manufacturer may be vertically integrated down-stream (undertaking mining activity), but not up-stream, selling the manufactured output (glass) to an unrelated window fabricator. The window fabricator (not the original glass manufacturer) is then in a position to bid on project contracts (probably not contracts with broad responsibilities, like project management, because the fabricator's part of the total value of a project would be too small to justify taking on the associated risks).

The least direct involvement a manufacturer can have on a project is through a contract for supply only (this will provide scope for normal client services plus limited scope for site-related services (e.g. transport to the site). The data indicate that two of the surveyed manufacturers fell into this category.

The most involvement a manufacturer could have in the B&C sector would be to operate from the mining/forestry stage through to high value build-own-operate projects. At least one survey respondent was involved in the system to this extent, if all the businesses controlled by the parent company were considered. This manufacturer provided all of the project services noted above, viz., installation, earth-moving, landscaping, plumbing, electrical, project management, ownership and facilities management.

As could be expected, the more stages a manufacturer is involved in the greater the scope for service-enhancement of products. The supply/value-chain literature supports this conclusion, indicating that value-creation opportunities are directly related the breadth of a firm's involvement in the supply/value chain (e.g. Walters and Lancaster, 2000; Normann and Ramirez, 1993).

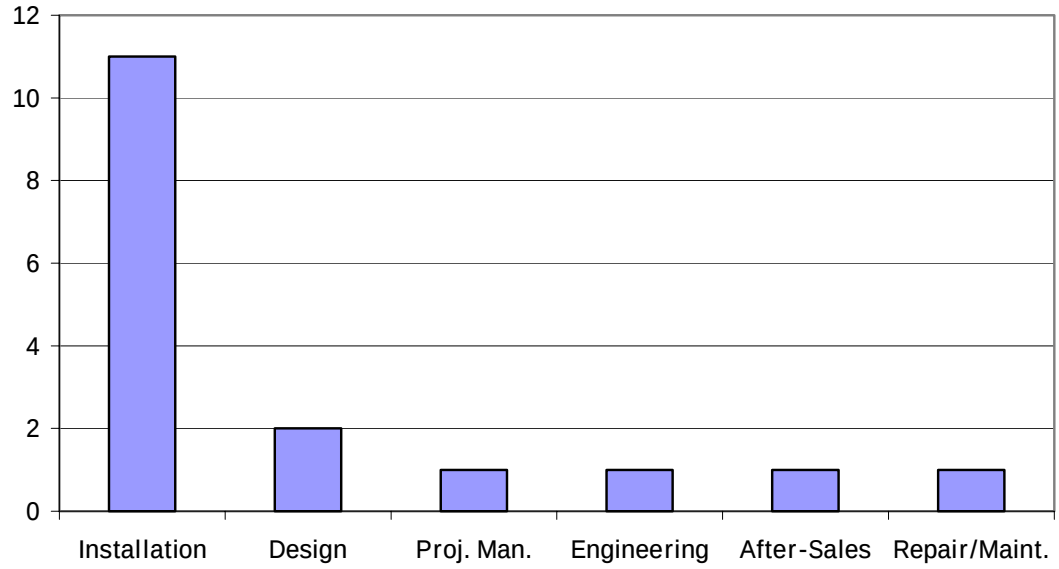
Further, interviews conducted alongside the survey indicated that the closer a manufacturer is to on-site work, the greater the scope for service-enhancement, as the project end of the supply chain is more service intensive than the raw material end.

Fourteen of the 18 respondents provided at least eight different services (as defined in Figure 1). Hence, more than three-quarters of respondents provided nearly half of the total number of services listed in the survey. This indicates a very high level of service intensity amongst manufacturers in the Australian B&C sector. Discussions with survey respondents indicated that this broad scope of activity is indeed the result of increasing client demands for the delivery of comprehensive 'total packages', as discussed earlier.

Three respondents provided four or less services; two of these respondents were the smallest businesses in the sample and had low levels of involvement in project-based work.

The highest value services offered are shown in Figure 3.

Figure 3: The highest value service offered, by number of respondents



Eleven of the 17 respondents able to answer this question nominated installation as their highest value service. This appeared to be because of the immediate revenue generated from installation services and the strategic role played by such services. It appears that installation services are of particular strategic importance to the manufacturers surveyed. As noted earlier, part of this importance lies in the scope to add further value via the provision of related services once an on-site role has been established.

Respondents were also asked to nominate the newest, most innovative and fastest growing services they offered.

Figure 4 shows that of the ten respondents able to identify the newest service offered, three nominated installation. Hence, installation services were again highlighted, although this time in a less pronounced way.

Figure 4: The newest service offered, by number of respondents

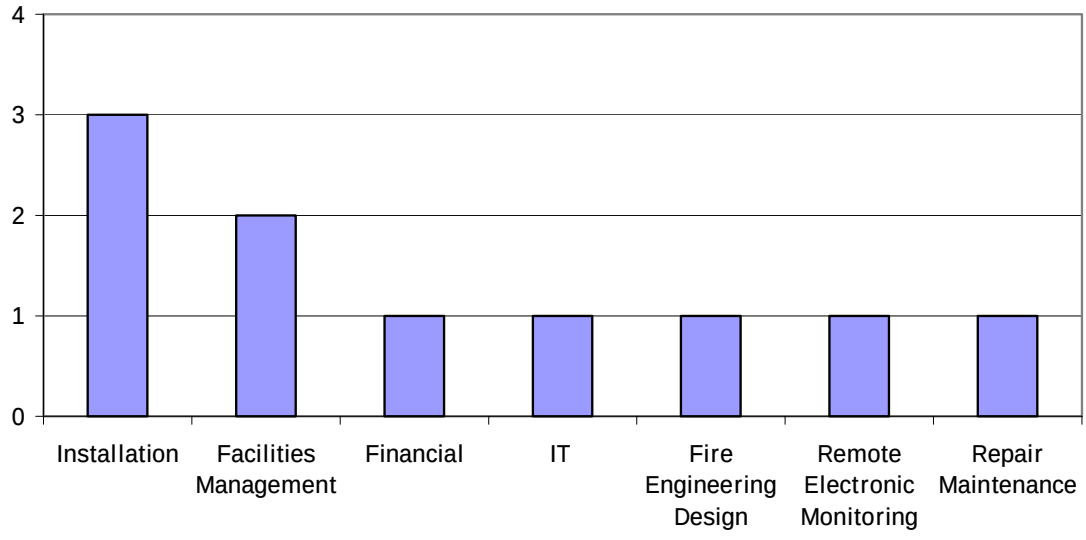


Figure 5: Most innovative service offered, by number of respondents

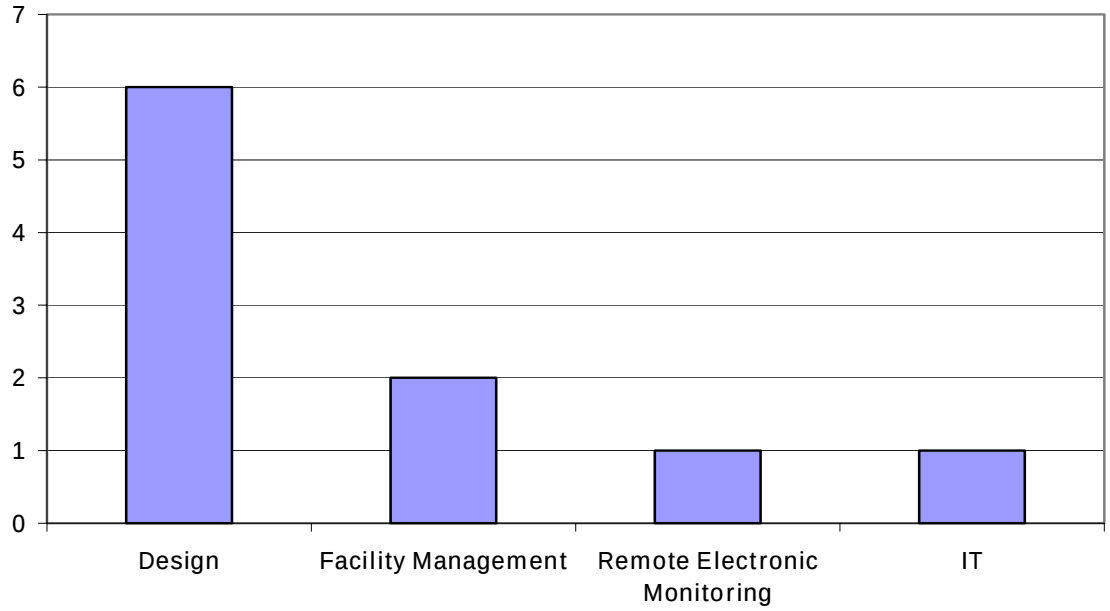


Figure 5 shows that of the 10 respondents able to identify the most innovative service offered, six nominated design services — three of the six were able to be more specific, noting design specialities such as web-based design, concrete design and fire engineering design.

The respondent nominating web-based design as their most innovative service explained that their clients (not project owners but major contractors in this instance) can scan in their plans and lodge them electronically at the manufacturer's web-site. This manufacturer is then able to provide product quotes and design analysis electronically. The major contractor uses the information provided to finalise its quote and submit a tender for say, a design and build contract. If the builder wins the job, the manufacturer is likely to become a sub-contractor.

Despite the examples of innovative design methods and applications noted above, discussions with respondents indicated that the result shown in Figure 5 tends to reflect the inherent creativity associated with design activity rather than indicating that the design methods employed or design applications were particularly innovative.

Figure 6 shows that of the eight respondents able to identify the fastest growing service offered, two nominated installation while another two nominated repair/ maintenance. The results indicate that there is no single service growing appreciably more rapidly than others offered by manufacturers supplying the B&C sector. Growth seems to revolve around the range of services offered. Twelve of the 18 respondents had 'greatly extended' the range of services offered over the past decade. This is to be expected given:

- an increasing desire on the part of project owners to limit the number of players they deal with and to obtain a 'total project solution' from one source
- the trend toward increased outsourcing of project functions by project owners, particularly in the public sector.

Scope for Service Enhancement

The scope for service enhancement by respondents was investigated with regard to export markets, negotiated contracts, independent marketing of services, and sources of service improvement.

Of the 13 respondents active in export markets, only four thought that services were markedly more important in those markets compared to domestic markets. It seems that the importance of services in export markets is very much related to the type of business being conducted in those markets. In this case, most of the respondents were selling to distributors rather than being directly involved on B&C projects. They

provided those distributors with the same services that they provided to their domestic distributors. Further, in most cases the distributor was responsible for after-sales service.

In contrast, respondents working directly on overseas projects (i.e. not using distributors) emphatically made the point that the service intensity of their contribution to those projects was greater than for domestic projects. For instance, overseas projects may involve:

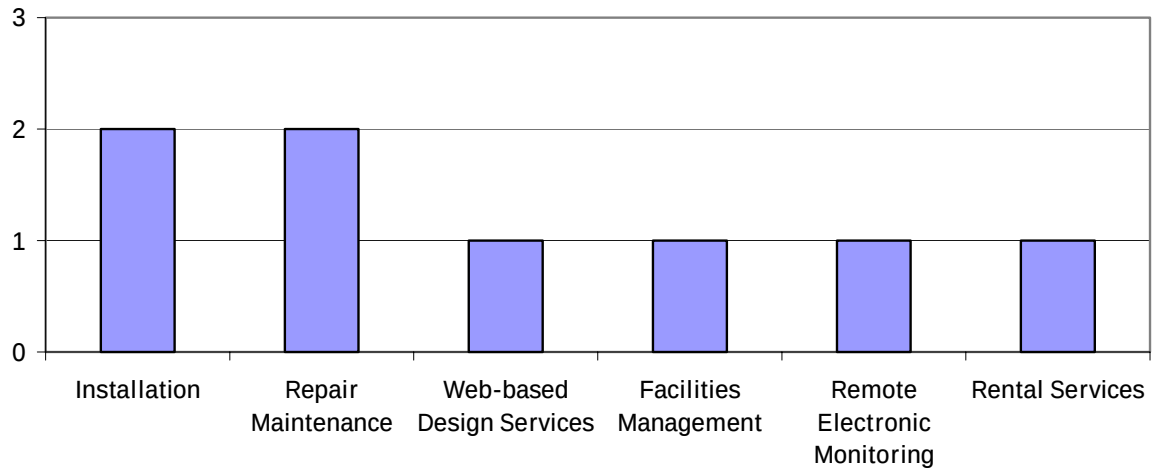
- a greater transport service component
- the need for translation services
- more elaborate packaging services (e.g. to ensure packaging can withstand extreme weather conditions, or extended travel, or handling by inexperienced parties)
- more complex after-sales service arrangements
- more complex design services (to meet overseas standards)
- more intensive system integration services (ensuring compatibility with foreign systems).

The differences found here between the service-intensity of project versus distribution activity in export markets supports the findings by Gann and Salter (1998) that service-enhancement is particularly important for project-based firms.

The survey also investigated the scope for service enhancement via negotiated contracts rather than open-bidding contracts. Eleven of the 16 respondents able to answer this question strongly felt that a dedicated (negotiated) relationship with project owners enabled them to deliver a greater range of services and better quality service. Further, several respondents noted that there was scope for greater provision of design services on negotiated contracts.

It appears that the four respondents who did not see greater scope for service enhancement on negotiated contracts felt that the common industry practice of submitting non-conforming bids in competitive bidding situations allowed the same scope for service enhancement (although many respondents disagreed with this view). This scope was thought to arise through the extra design work, although clearly under these conditions there would be, for instance, less scope to negotiate a position of project management. Also, in a competitive situation, the scope for service enhancement is limited by the manufacturers ability to win the contract with a non-confirming bid, as opposed to negotiated processes, which provide greater security.

Figure 6: Fastest growing services offered, by number of respondents



These results highlight the extent to which relationships with clients create opportunities for value-adding via the provision of services. In part this is because the additional communication with clients involved in negotiated contracts allows the manufacturer to better understand client requirements, putting it in a better position to provide a comprehensive and effective package of products and services to meet *total* client needs. The importance of such 'bundling' opportunities to the profitability of manufacturing enterprises was discussed earlier.

This 'bundling' is reflected in marketing behaviour. For instance, of the 18 respondents, 15 never marketed services independently of products. Of the three that did, one respondent often provided facilities management services in relation to facilities built and installed by competitors, while another respondent occasionally provided colour consultancy services and landscaping design services independently of products.

These findings support the notion of the emergence of an *integrated* manufacturing-services sector, which was raised by Pappas and Sheehan (1998) and discussed earlier. It appears that the services provided by manufacturers are complexly entwined with their physical output, so much so that it is not profitable for them to provide services independently. As may be expected, the core value of operations seems to remain with the manufacturing activity.

The last question in the survey sought to determine the extent to which project-based learning was the key source of learning in relation to service improvement, compared to the role of on-going business processes (such as annual market surveys). Of the 16 respondents answering this question, nine felt strongly that service improvement arose mainly from project work, while seven supported the proposition less strongly. The latter group appeared to be less involved in on-site work.

This finding adds weight to the proposition that the overall competitiveness of manufacturers in the B&C sector is influenced by the extent of their involvement in project-based work and the extent to which they maximise opportunities arising from such involvement.

Although project work is clearly a major source of service improvement, several respondents considered that market surveys were also an important source of learning.

CONCLUSION

The literature review conducted for this paper indicated the importance of integrated provision of products and services. The empirical work conducted for this study suggests that such integration is growing in the Australian B&C sector. Manufacturers are:

- providing an expanding range of services and already provides all of the services indicated in the literature reviewed
- reaping significant value from service provision.

The results of the study support many of Gann and Salter's (1998) findings, namely that:

- manufacturers are 'bundling' products and services to improve business performance
- the distinction between products and services has become blurred
- the delivery of new services has been driven by changing client demand patterns
- manufacturer competency in adding services to original physical products is a key driving force behind manufacturing; and
- services are increasingly necessary to ensure sophisticated component systems can be designed, integrated and operated.

Indeed, the 'blurring' of the distinction between products and services complicated the research process underpinning this study. Interviewees found it difficult to identify the services they offered without prompting from the researcher, as many of their services were so closely associated with their products that, to the respondents, the services were essentially part of the products.

Despite supporting Gann and Salter's (1998) finding that changing client demand patterns are a key driver of service-enhancement of products, this study found that manufacturers were not always keen to provide a broader range of services. Some manufacturers felt pushed to provide a greater variety of functions on projects in order to maintain profitability. However, in an ideal world, they would choose to concentrate on a more limited range of core competencies.

Many manufacturers rely on high-level service skills to underpin overall performance. This was particularly true of manufacturers providing complex component systems. Such findings support Gann and Salter's (1998) observation that service-enhancement of output drives manufacturing success in knowledge economies.

This project has made a key contribution to the literature in terms of our knowledge of the role of different services in manufacturers' operations, and the factors influencing the scope of service-enhancement.

The present study found that installation and design services are of particular strategic importance to manufacturers. Both these services play crucial roles in securing projects and are key gateways to adding more value via the provision of other services.

This study also found that greater scope for service enhancement exists:

- for project work in export markets compared to domestic markets (although this finding does not apply to more straightforward distribution arrangements overseas)
- in relation to negotiated contracts compared to open bidding contracts
- in relation to the joint provision of products and services, compared to marketing services independently
- through project-based learning, compared to learning arising from on-going business process (such as annual market surveys), particularly if the manufacturer is heavily engaged in project-based work
- where a manufacturer is engaged in several stages of the supply-chain
- where a manufacturer is operating close to the project-end of the supply-chain.

The higher levels of service enhancement recorded were associated with larger manufacturers producing more complex products. Further, the concept of 'service-enhancement' or 'value-adding through the provision of services' was far more readily understood by such manufacturers compared to smaller manufacturers producing a single, relatively simple product.

Further research, conducted on a larger scale than the present study, is required to improve the robustness of results. Such research appears to be warranted based on:

- the extent to which service enhancement is undertaken by manufacturers
- the role that such enhancement is said to play in the formation of integrated manufacturing-services sectors
- the apparent importance of such sectors in the effective functioning of successful knowledge economies.

In particular, although this study supports suggestions in the literature that client demands are an important factor underpinning increased service provision by manufacturers, it is necessary that further investigation be carried out to determine manufacturers' capabilities to meet these new demands, for example, how are smaller manufacturers coping with these trends? It is also important to understand the limits to the new integration: how do manufacturers manage the expansion of their core capabilities into new service areas, and how does such expansion impact on service providers? Interviews conducted for this paper suggest that these are important issues worthy of further attention.

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