

Bucket vs. Real-Time Scheduling in Workforce Management

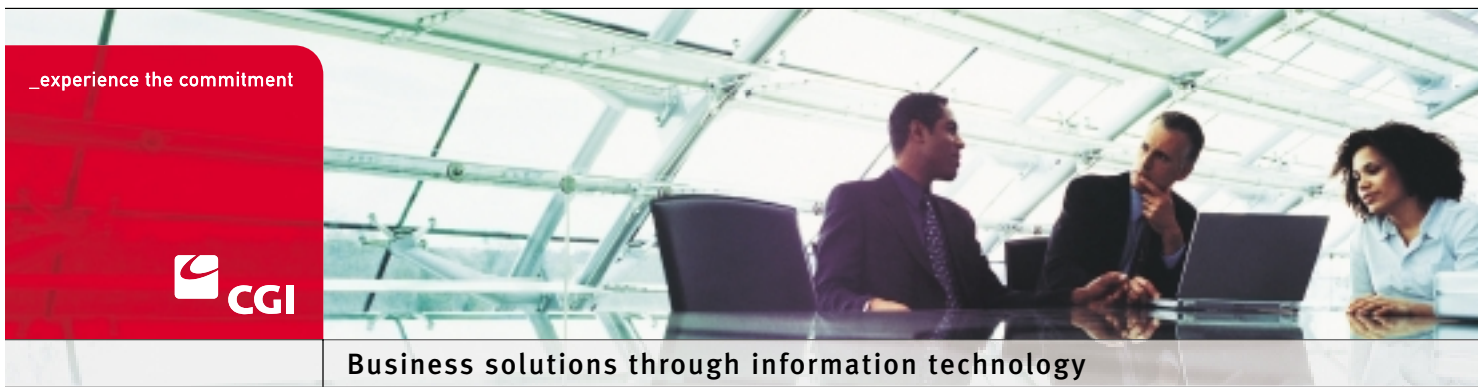


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Introduction

Workforce management in the utilities sector has gained unprecedented significance in the wake of mounting customer expectations and heightened competitiveness within the industry. Never before have utilities been so challenged to efficiently deploy their customer service, maintenance, emergency and construction field work crews. Like other industries, utilities have the opportunity to apply advancements in computer-based systems to meet this challenge faster, cheaper and better - all in the aid of fostering customer loyalty.

The Challenging Context

While an emergency team works to restore power from an outage caused by an impaired driver smashing into a hydro pole, a truck collides into a pole on the other side of the city. A gas leak detector sounds an alarm at a business downtown. A homeowner who runs a home-based day care is complaining that her tap water is brown. The lead on a work team broke his leg playing soccer last night and he's not going to make it for 7 a.m. at a residential construction site to install new services.

Knowing who to send where and when has always been a challenge for utilities. But now that deregulation has fuelled a competitive market, the stakes are much higher for delivering cost-effectively and expediently the high quality service that customers have quickly come to expect.

Industry standards and customer demands require utilities to be increasingly precise and accurate when providing information and service, as well as when they schedule appointments with their customers. It is no longer acceptable for a utility to meet its commitments most of the time; it is expected to meet its commitments all the time. Moreover, customers count on uninterrupted service regardless of storms or other similar situations. Meanwhile, the reality of the competitive market brings additional pressure to reduce costs to provide the cheapest yet still reliable utility that customers seek.

Field maintenance has become a key element in extending the return on earlier investments in grids, making managing that workforce with the greatest effectiveness even more compelling.

A workforce that is also aging is another driver for automation. An electronic system can help capture the knowledge of senior staff retiring from the control room.

Further, merger and acquisition activities have resulted in single utilities providing both gas and electric services. These utilities need a workforce management system intelligent enough to effectively gain full benefit from workers with a combination of very distinct work skills.

Clearly, providing service that shrinks customers' waiting time and safely optimizes resources is a complex feat. It entails ensuring that field resources are at peak efficiency - for example, that field resources follow a route that minimizes unproductive travel time to maximize the amount of work done in a day. But the challenge remains: how does the utility achieve such efficiency when appointments are taken for a given day, weeks in advance, all over the service territory?

Two differing approaches - bucket and real-time - are being applied to address this challenge. Each has advantages and disadvantages dependent upon a utility's particular environment.

Bucket Scheduling Approach

The most common approach to managing the workforce for daily operations and crisis situations is what is referred to as the bucket approach. In this approach, the service territory is divided into areas and the work is divided into categories or types of work. A fixed number of work hours is allocated for each work type, in each area of the service territory, during specific periods of the day - usually AM and PM.

For example, suppose the utility has three types of work (A, B and C) and divides its territory into four quadrants: Northeast, Southeast, Northwest and Southwest. For each period (morning and afternoon), a number of hours (the bucket) is allocated for each work type, in each quadrant. The following table provides an example.

Period/Quadrant	Northeast	Northwest	Southeast	Southwest
Monday AM	A: 20 hours B: 10 hours C: 10 hours	A: 20 hours B: 0 hours C: 10 hours	A: 20 hours B: 15 hours C: 10 hours	A: 10 hours B: 15 hours C: 10 hours
Monday PM	A: 25 hours B: 5 hours C: 10 hours	A: 20 hours B: 20 hours C: 10 hours	A: 30 hours B: 20 hours C: 0 hours	A: 20 hours B: 5 hours C: 10 hours

Thus, according to this matrix, ten hours of work of type C can be scheduled for Monday morning, in the Northeast quadrant. Once the matrix is established, whenever an appointment is taken, the available time in the appropriate bucket is reduced. For example, if a three-hour job of type C is scheduled for Monday morning in the Northeast sector, the remaining available time goes from 10 to 7 hours.

If a bucket is empty, and a user (such as a call-taker) requests an appointment in that time slot, the system returns a negative answer and typically tries to find available time on the next day.

With this approach, at the beginning of each day, the dispatcher examines the commitments taken and the resources available in each period, and attempts to fit one with the other.

Advantages

The key advantage of the bucket approach is that it is not necessary to identify in advance the individual resources that will be working on any given day. It is only necessary to identify the amount of hours of work of each type that can be performed in each area of the territory, during each period. Thus, the bucket approach to scheduling simplifies resource planning.

But what happens if:

- your customers resent not knowing just when in the morning to expect the service call?
- a worker can't make it to work for a couple of days?
- the buckets are empty with the resources all assigned but service still has yet to be restored?
- a field technician runs into a major snag and gets less work done than scheduled or, conversely, completes more work than expected?

Disadvantages

The disadvantages of the bucket approach come from its disconnect with the reality of day-to-day work. First, it is difficult with the bucket approach to commit to a fixed appointment time with any level of certainty because work is assigned to periods, not particular times. The order in which a technician's work is done during a given shift is not managed. Customers can thus only be given periods, typically no shorter than half a day, during which a crew is scheduled to visit.

Also, although the number of hours of work that can be performed during any period is known, the identity of the resources that make up that availability is not. Thus, if a resource needs to be absent for a particular day in the future, it is difficult to know what the impact of

this absence will be, since work is not assigned to any particular technician ahead of time. Similarly, when a technician calls in sick in the morning, the amount of time in the bucket is reduced significantly, and the remaining resources are automatically overbooked.

If, when the buckets are originally set up, the number of hours available "per bucket" is underestimated, resources may be overbooked, and appointments missed. Typically, when this occurs on several occasions, the utility can increase the number of hours in the concerned buckets, but this may in turn lead to resources having less work to do than their shift duration could allow. In either case, management is done reactively, not proactively.

Several software solutions on the market offer workload leveling functionalities, which allow the user to automatically redistribute work among crews when some crews are overloaded. However, if the scheduling is done according to the bucket approach, the leveling of the workload can only be done within a particular bucket. For example, if three crews make up the availability for a given bucket and one is overbooked, its extra work can only be redistributed among the other crews in the same bucket. If the other crews are also busy, the appointments will be missed. Likely the next day's schedule is already booked, and so goes the game of catch-up, creating an extra burden on the customer-facing work crews having to mollify disappointed if not irate customers. If, in an effort to catch up, work is not scheduled for a 72-hour period, for example, any earlier availability is ignored. This is not very effective scheduling.

Real-Time Scheduling Approach

In the real-time approach to scheduling, also referred to as a one-pass planning tool, the work schedule of each individual technician is established ahead of time, for each day in the future. As work orders are created in the system, each is assigned immediately to a particular technician, for a particular date and time.

The most effective real-time approach incorporates a mobile communication link between the field crews and the dispatcher so that analysis and monitoring of job progress is truly performed in real-time.

Advantages

The real-time solution has a great number of advantages. First, with this approach, it is possible to schedule appointments to exact times rather than within periods, thus better serving customers. It is also possible to know in advance exactly which technician is assigned to each order, so that if technicians need to be absent, dispatchers know exactly what appointments will be affected.

Furthermore, technicians can find out in advance what orders are assigned to them individually, not only for the current shift, but for future days as well. Consequently, technicians traveling to remote parts of the territory can check if any of their work for future shifts is also located in that area, and then complete that work all in the same visit. Similarly, a field technician finishing the assigned work for the day can look at his/her assignments for upcoming days and get started on them. Real-time scheduling empowers field workers to manage their work more efficiently and consequently enjoy it more and bring more value to the utility.

Also, with this approach, workload leveling is not as restricted as with the bucket approach. If, on a given day, the workload of the various crews is unequal, it can be leveled across days and areas of the territory, not just within one bucket. For example, if all crews in a sector are overbooked, some of their workload can automatically be transferred over to under booked crews in other sectors, allowing fewer commitments to be missed. Alternatively, assignments that are not appointments with customers can be rescheduled to less busy days.

Those utilities combining gas and electric services find that real-time scheduling is a valuable tool that readily marries gas and electric dispatching. The bucket approach only reveals that

for a given region there are a certain block of time available. The real-time scheduling assesses the location of field resources capable of handling either gas or electric or both, so it can more readily respond to either a gas order or electric call.

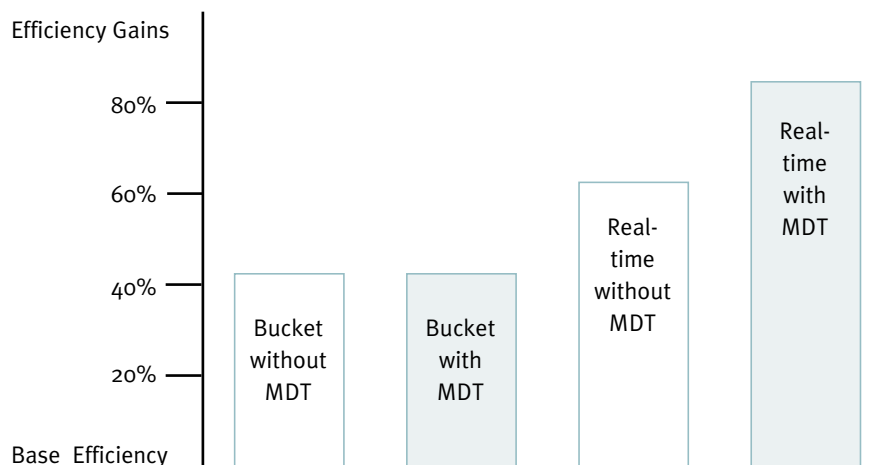
A one-pass planning tool like real-time scheduling typically has a positive impact on clerical resources. In utilities using the bucket approach, every morning a load of orders for a given day is dumped onto a dispatcher who must match the orders to the field staff. This planning tool can cut that morning dispatch workload down by as much as 95 per cent because only the exceptions require attention. A number of major North American utilities found that they could go from a dispatcher to crew ratio of 1 to 15 to 1 to 35 or 40, freeing dispatch staff for more strategic deployment. So, as well as improving customer service, real-time scheduling can help utilities increase their efficiency and drive a stronger return on equity (ROE).

These advantages are further heightened when the real-time scheduling includes a communication link between the mobile field workers and the scheduling/dispatch office so that appropriate maintenance and service provision crews, for example, can be matched to evolving situations. In this way, information necessary for effective short- and long-term decision-making relating to distributing work is available at all times. Further, efficient communications to the field also supports field information exchange and applications.

In fact, that mobile connection between field staff and the office has become a critical component in the effectiveness of the overall workforce management. If the back office can only make assumptions about what is going on in the field, the scheduling is less proactive and effective than it could be. If the scheduler is not aware that a job is taking an extra three hours and affecting the timing of two other jobs, he or she cannot respond in time to prevent jobs from overflowing into subsequent days. Instead, rescheduling that could have been avoided may be required at the end of the day.

Additionally, if a utility's work force is manually reporting their progress, five or more days could pass before the scheduler becomes aware that a job was not completed on schedule.

The following table compares the estimated efficiency gains between the bucket and real-time approaches with and without mobile data terminals (MDTs). The use of MDTs with the bucket approach makes no difference to its effectiveness because buckets of time rather than human resources are being scheduled. Whether issuing a work order in an electronic form or on piece of paper has little impact. However, with the real-time approach, a live wireless mobile device in the hands of the field staff means that if a window of time just opened up 30 seconds ago by a job being completed early, for example, work scheduled for the next day in this area requiring that technician's skills might possibly be accomplished now - bringing greater satisfaction to the customer and cost savings to the utility.



Clearly, truly real-time scheduling with current information flowing from and to the field crews enhances the flexibility and overall effectiveness of this approach. It has been estimated that having a real-time mobile link between field environment and office boosts the effectiveness of workforce management by at least 60 per cent.

In short, real-time scheduling empowers utilities to optimize their procedures and workflows by enhancing job scheduling and load leveling functions. It provides more real-time, consolidated information on crews, their availability and their jobs, to help better forecast, plan and re-assign resources as needs change. Truly real-time scheduling enables utilities to stay in control and cost-effectively provide the service levels necessary for customer satisfaction.

Disadvantages

Scheduling work in real time requires by definition that the schedules of technicians be established ahead of time. Thus, the approach requires that more planning of who does what and when be done up front, and that more information be made available to the system in advance. However, this kind of information is usually already managed in one way or another by the utility, for example through payroll. The information required to do scheduling in real time can thus usually be ported to the scheduling application with minimal effort, allowing the utility to easily reap the benefits of real-time scheduling.

Other considerations

Adopting either the bucket approach or real-time scheduling requires a similar change management effort. Both approaches entail implementing technology which in turn requires training staff and helping them adjust to change.

Also, the actual cost of each approach is nearly identical, although the return on investment (ROI) is arguably faster and greater with real-time scheduling.

Conclusion

While both approaches are viable, the adoption of the real-time scheduling approach offers greater advantages, most notably enhancing customer satisfaction through more accurate service scheduling. Software technologies for such an effort are readily available in the market today and many utilities are already moving ahead in this direction. If you decide to pursue this approach or want more information, please consider CGI as a viable partner to assist you. As a leading provider of such software solutions and associated services, we can help you gain the maximum benefits to meet your business needs.

About CGI

Founded in 1976, CGI has worked with clients in a wide range of industries to help them leverage the strengths of information technology (IT) to optimize their business performance and produce value-driven results. We also offer a comprehensive array of business process outsourcing (BPO) services, enabling us to help manage and improve our clients' day-to-day business processes while freeing them up to focus more on strategic decision making. Our consulting, systems integration and outsourcing services provide a total solution package designed to meet our clients' complete business and technology needs. We approach every engagement with one objective in mind-to help our client win and grow. CGI provides services to clients worldwide from offices in Canada, the United States, Europe and Asia Pacific, as well as centers of excellence in India and Canada. Learn more at www.cgi.com.